

# SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE  
OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION  
FOR THE ADVANCEMENT OF SCIENCE.

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FRIDAY, JUNE 5, 1903.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

## AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. SECTION I, SOCIAL AND ECONOMIC SCIENCE. I.

At a business meeting held on Monday morning, December 29, the organization of Section I for the Washington meeting was perfected with the following officers:

*Vice-President*—H. T. Newcomb, Philadelphia.

*Secretary*—Frank H. Hitchcock, Washington.

*Member of Council*—Marcus Benjamin.

*Sectional Committee*—Carroll D. Wright, Vice-President, 1902; Frank R. Rutter, Secretary, 1902; H. T. Newcomb, Vice-President, 1903; Frank H. Hitchcock, Secretary, 1903; Frank R. Rutter, for five years; B. E. Fernow, for four years; Carroll D. Wright, for three years; E. L. Corthell, for two years; Henry Farquhar, for one year.

*Member of General Committee*—Le Grand Powers.

On Monday afternoon Hon. Carroll D. Wright, the retiring vice-president of the section, delivered an address on 'The Psychology of the Labor Question.'

Morning and afternoon meetings of the section for the presentation of papers were held on Tuesday, Wednesday and Friday.

The program consisted of thirty-five papers. Abstracts of these papers are presented below.

*The Economic Law of Competition and of Monopoly:* ALLEN R. FOOTE, editor of *Public Policy*.

Mr. Foote in his paper pointed out that

all industries might be divided into two classes, viz., competitive and monopolistic. Under the head of competitive industries he included the production of all commodities which could be transported to be sold in markets other than that of their origin. Under monopolistic industries he classed public service corporations. He then proceeded to show that in competitive industries, if the price of the article sold was raised too high or so as to obtain an undue profit, fresh competition would be induced. On the other hand, the cost of a unit of production decreased as facilities for producing an increased number of units within a given time were developed or acquired. By example he showed that the economic selling-price for production in lots of 1,000 was less than the cost of producing in lots of 100. Consequently the producers of lots of 1,000 would kill off all producers in lots of 100. Similarly the economic selling-price for lots of 10,000 was less in cost of production for lots of 1,000. Finally, the economic selling-price for 1,000,000-lot production would be less than the cost in the 100,000-lot production. So that, ultimately, the largest producers of unit lot productions would kill off all smaller producers. Mr. Foote said that the large combinations which were able to turn out unit lot productions on an immense scale were public benefactors. They could not become odious monopolies because they were always bound to safeguard themselves against attack from competition and also against the possibility of making active the latent force of potential competition. Every reduction in selling-price broadened markets by bringing the product within the buying power of an ever-increasing number of consumers. This was the process which tended to make the luxuries of the rich the necessities of the poor. In order, however, for economic production to be carried on

profitably along competitive lines, secrecy in management was absolutely essential. And this was true whether the producer was a single person or a large combination of corporations. The present anti-trust law and all other laws which made a distinction between different classes of manufacturers in competitive industries were illogical and indefensible as an interference with freedom of contract, were clearly in conflict with the natural law of economical development and were not really for the interest either of workmen or of consumers. Public service corporations, which were naturally monopolistic, Mr. Foote pointed out were on an entirely different footing; these should be strictly regulated by laws determining the cost price of services rendered and allowing, in addition thereto, a fair economic profit. This was all that could be done by public ownership, and, in Mr. Foote's opinion, when the public clearly realized this they would no longer place unnecessary burdens upon public service corporations, because each of these burdens had to be paid for by the consumer.

As a logical conclusion Mr. Foote suggests that the Sherman anti-trust law be revised to make it properly applicable to industrial corporations only, excluding from its operation inter-state transportation corporations, that the inter-state commerce law be revised properly to deal with inter-state transportation corporations only, and that the states take similar action applicable to business and public service corporations.

#### *Remarks on Capitalization and Publicity:*

Hon. MARTIN A. KNAPP, chairman of the Inter-State Commerce Commission.

Mr. Knapp discussed the proposition that all corporations under congressional control be required to make full disclosures

of their genesis and operations, so that it may be seen how the amount of money originally paid in, or the value of the assets at any time owned, compares with the par value of all bonds and stocks issued. He expressed doubts as to the soundness of the argument that publicity would prevent stock-watering, believing it unproved that the excessive issue of corporate securities was a source of such danger as to excite public alarm. He said he was yet to be convinced that enforced publicity would not be a harmful exercise of public authority.

His remarks were in part as follows: I maintain that the stockholder, as such, is not benefited by corporate publicity, and would be harmed rather than helped by its enforcement. It is one thing for the stockholder to have knowledge of the concern whose shares he holds; it is quite another thing to furnish the public the same information. I fail to see that publicity can be desirable to the stockholder. The justification for this proposal, therefore, must be found, if at all, in the theory that the state is charged with the duty of safeguarding the investment of capital in corporate securities. To my mind this is a most serious proposition, and I think we should long hesitate before embarking upon such a paternal venture. Leaving out the speculator and taking into account only those seeking honest investment, ten times more money, to say the least, has been sunk in farm mortgages, suburban lots, patent rights, buying and selling grain, cotton and other commodities, where no corporate shares were dealt in or even existed, than was ever lost on account of the fictitious or excessive issue of corporate securities. I can not but regard corporate publicity of the kind and to the extent advocated by many as a certain and serious hindrance to effective competition. Just

as the Sherman anti-trust law, which is based upon an economic fallacy, has indirectly aided the very results it was designed to prevent, so the compulsory disclosure of all corporate transactions would undermine the competition it was intended to support. Bearing in mind how rapidly all kinds of business are assuming the corporate form, that the competition of individuals is fast disappearing, and that competition in the future will be mainly between corporations, it seems plain to me that the enforcement of corporate publicity would be an added incentive to industrial combination. Therefore, as I view the matter, the remedy in question will be worthless to the great mass of people, the consumers, for their troubles are not caused by watered stock and will not be alleviated by publicity. It will not benefit the actual stockholder, for however much he may need information for himself, his interests would not be promoted by bringing that information to public knowledge. Against its doubtful and very limited usefulness to the intending purchaser of corporate shares is the danger, not to be lightly estimated, of giving sanction to a principle of extreme paternalism and furnishing a fresh impulse, not to compete, but to consolidate.

*The Necessity of Organization among Employers:* DAVID M. PARRY, president of the National Association of Manufacturers.

The great need of the world to-day is organization—organization in every line of human effort. The workers of the land began to organize seventy-five years ago, and although their organizations have been by no means perfect, either as to management or numerical strength, yet they have been able, in consequence of them, to wield much power both with their employers and with

law-making bodies. But capital is as essential a factor in production as labor, and it is as necessary for the welfare of the country and the human race that its rights be recognized and protected as those of labor. In order to protect these rights organization is necessary. In union there is strength.

Heretofore in this country there has been no such thing as organized capital. It is true that there is consolidated capital—accumulations of capital brought together for the purpose of enlarging productive power—but consolidated capital is not organized capital. A definition of the latter term, I take it, should be an organization of men, engaged in different lines of industry, who are brought together for the purpose of protecting the general interests of capital, that the industrial prosperity of the country may be maintained and increased. Unorganized labor can not make known its wants, nor can unorganized capital do so.

The growing organization of labor in recent years makes it all the more imperative that capital organize. Although organized labor represents only fourteen per cent. of the sixteen millions of workers in this country, yet by its persistent agitation in the press and the political field it has in manifold ways affected the business and political life of the nation. It is to be admitted that it has accomplished much good. If it had done no more than to secure the standardizing of the coupler on freight cars by which loss of life has been minimized among railway employees, the right of labor to organize would be vindicated. There can be no question that there is a large field of usefulness for such organizations.

But while labor organizations can accomplish much good, they can also, if

misguided, accomplish much evil—evil for the workingmen themselves as well as for progress and civilization. To-day these organizations are thoroughly permeated with socialistic principles, which they are attempting to put into practice, and which program, if successful, can not but result in industrial destruction. The four principles of trades-unionism to-day are: (1) Men shall have the right to say how long they shall work; (2) how much they shall turn out; (3) how much they shall get; (4) who shall be employed. If ever the employer declines to admit these propositions there is the strike and the boycott, and consequent industrial loss. If successful in enforcing their principles, there is also industrial loss, for these principles mean the bringing about of uniformity of effort among men, and a diminishing of their productive power, both of which must prove fatal to the best interests of humanity. Uniform effort means the squeezing of men into one puny mould, and the enthronement of sullen and impudent incompetency and stupidity. Decreased productive power means less consumable wealth to be distributed. Organized labor appears also enamored of the idea that all wealth produced must be distributed, thus preventing those accumulations of capital which tell so much for the increased productive power of a nation.

To combat the errors of organized labor is a duty which compels the organization of capital. Organized capital could also accomplish much in devising ways and means for the advancement of the commercial supremacy of the republic. When capital and labor are both organized they can sit down together and settle their disputes in an orderly and scientific way, and there would be an end to strikes and boycotts, hurtful to both.

*The Right of the Laborer to His Job:*

WALTER S. LOGAN, New York city.

The question is considered under two heads: (1) The moral right, and (2) the legal right.

Under the first head Mr. Logan shows that the human species is of such a complicated structure, and the requirements of its existence and development so multi-form, that labor is a necessity. Besides, we alone, of all the species that inhabit the earth, have organs which make productive and sustained labor on any considerable scale possible.

Labor, therefore, must have been not alone the necessity of our existence, but the intention of our creation.

Mr. Logan then argues that if labor is the necessary condition of our existence, and by labor alone can the apparent end of our creation be fulfilled, the right to labor—that is, the right to have a chance to labor—must be considered one of the primary rights of humanity.

Mr. Logan, summing up this branch of the subject, says:

"Theology and science both agree as to the substantial import of the decree which emanated from the garden of our nativity, whenever that garden and wherever that nativity was. By the sweat of man's brow he is to earn his daily bread. Call it a doom or a birthright, whichever you choose. The right is the necessary consequence of the necessity. If man *must* earn his daily bread he has a right to do so."

Under the second head, 'The Legal Right,' Mr. Logan argues that a legal right is only the formulation of a natural right. The statutes which punish killing do not *make* murder a crime; they simply recognize it as such. Mr. Logan says:

"If a man has a moral right to work there is some legal recognition of that

right, or such legal recognition must be formulated whenever it is required.

"If the right was omitted from the enumerations in the Magna Charta or the Declaration of Independence, it was because those were times in which work, though comparatively unproductive, was plentiful. There was always enough to be done."

Mr. Logan's paper concludes with a description of the legislation which he conceives to be necessary to place the right of the workman to his job upon a solid legal basis. He concludes as follows:

"I think the time has come when we must rewrite the Declaration of Independence so that it will read, 'All men are entitled to certain inalienable rights, and among those rights are life, liberty and a job.'

"Perhaps that is the way the distinguished author of the Declaration intended it to be read. The phrase 'the pursuit of happiness' may have been only his synonym for 'a job.'"

*Recent Aspects of the Immigration Problem:* Professor ROLAND P. FALKNER, chief of the Division of Documents, Library of Congress.

The fact that in the last fiscal year immigration rose to a height almost unparalleled in our experience draws attention anew to the immigration question. In the closing decade of the century it had fallen off considerably and some felt that its end was drawing near. But it has taken a fresh start, and it behooves us to examine what is its contribution to our population and what are the questions which it raises. It is a mistaken idea to suppose that the foreign-born element grows apace with immigration. There are deaths in the ranks of the older settlers to be made up by the new before there can be a net gain. Though

half a million Germans came to the United States between 1890 and 1900, there were fewer Germans in the country at the latter date. But this does not account for the entire discrepancy in growth. In 1900 there were only ten per cent. of the immigrants arriving in the previous decade enumerated by the census. Some had died, some had returned to their native lands. This brings out the fact that the volume of immigration is an inaccurate criterion of the addition to the population, and is growing more so.

The ease of movement to the country is supplemented by the ease of getting away, and many of those who come to our shores are not true settlers among us, but passing visitors. This introduces a factor of the greatest moment. It has always been assumed by those who look upon immigration in an optimistic spirit that, however awkward he might be in his accomplishment, nothing was more characteristic of the new arrival than his desire to become an American, and many were content to take the will for the deed. But we are now confronted with immigrants who have no such desire; whose only wish is to make the most of their economic opportunities and enjoy the fruits of their toil elsewhere. It is highly desirable that statistical information be collected as to outgoing steerage passengers, that we may not be left to conjecture as to the extent of this movement.

We are frequently told that the immigrant would be welcome if he would go west and develop the country, but that he persists in staying in the eastern states and in crowding into the cities. However much public attention has been called to this matter, it is not exactly a new phase of the immigration problem, nor is it an indication of the perversity of the immigrant. The immigrant has not contributed much

to the development of the country. He has followed in the wake of the nation, and at each census since 1850, when the foreign-born were first separately enumerated, they have been relatively more numerous in the eastern states. It can not be wondered that the foreign-born flock to the cities since the native-born do the same thing. Each follows the opportunities for labor. Since city growth is the characteristic of modern time, towns naturally attract population, particularly those elements not rooted by the possession of land to the soil. Groups of foreign-born in cities, moreover, yield sooner than like groups in rural districts to the contact with the English-speaking element, and here is some compensation.

But however unusual the phenomena noted, they should not, therefore, give less concern. The protection of the standard of life, or of American ideals, is the first duty of the statesman. The exclusion of all those who do not give reasonable promise of an ability and will to conform to our institutions is a duty which can not be put aside.

*Bosnia: A Problem in Civil Administration:* WILLIAM E. CURTIS, Washington, D. C.

William E. Curtis read from advance sheets of 'The Turk and His Lost Provinces' now in press, an interesting description of the regeneration by the Austrians of Bosnia, a former province of Turkey which was placed under their protection by the powers of Europe after the Turko-Russian war in 1878. At that time Bosnia was one of the most unhappy and hopeless places on earth; but since its release from Turkish domination it has become one of the most peaceful and prosperous provinces in Europe. Nowhere else in all the continent has there been so rapid

an increase in population and wealth or so profitable a development of natural resources.

Under the Turks murder was not considered a crime, and it is estimated that from ten to fifteen thousand people were killed annually by the soldiers and by each other. During the last ten years, out of a population of nearly two millions the homicides have averaged only six a year, and in 1900 there were only two. In Turkish times robbery was as common as lying, and farmers hid their cabins where they could not be seen from the highways, for fear of raids from bandits and marauding soldiers. There has been no case of robbery in Bosnia since 1895, and in 1900 but one case of burglary. Other crimes are equally rare.

The population of Bosnia is about 2,000,000, one third Moslems, one third members of the orthodox Greek church, one fifth Roman Catholics, and the remainder Protestants and Jews. The population has doubled in twenty years, and is increasing at the rate of ten per cent. a year. The people are peaceful, contented and prosperous. The cities are filled with new and handsome houses. Factories are being erected to utilize the water power and consume the raw material produced in the country. Training schools and other institutions have been established to qualify the people to make the most intelligent use of their opportunities. Members of the different religions mingle on amicable terms and show mutual respect and toleration. Taxes are low and are honestly collected and disbursed; the courts are wisely and justly administered, and the people have learned for the first time to appreciate a just and liberal government.

Bosnia is the first province of Turkey that was ever well governed. Enlightened Mohammedans who have observed the ad-

vantages are gradually yielding, and while no adult Moslem was ever converted to Christianity, they are adopting the customs of the western world, and their women are being released from the degrading position which they occupy in all the lands of Islam.

Mr. Curtis suggested that there was much in the Austrian experiment in Bosnia that might profitably be imitated by the United States in the Philippines.

*The Sources and Margin of Error in Census Work:* LE GRAND POWERS, Chief Statistician for Agriculture, U. S. Census.

The most important sources of error in census work are those of omission and duplication by the enumerators. Such errors have occurred in all census work.

In the census of agriculture the omissions are most numerous in sparsely settled sections where there is much irregular land surface. The duplications are most numerous in sections of the opposite character, and especially in communities with a large development of tenant farming.

The census office can and does check against duplications, and these checks have been more fully developed in the twelfth census than ever before. The office can not, during the work of schedule revision and tabulation, check against omissions of farm land by enumerators. Hence the probability of greater omissions than duplications in the completed report.

An analysis of census data, and comparisons of the same, with the records of assessed land, shows greater omissions than duplications in all parts of the country.

The omissions of farm land in Iowa equal about 1 per cent., and the duplications of errors of calculation or revision that have a tendency to unduly exaggerate

area aggregate about .8 per cent., thus leaving the final report less than a complete exhibit.

In Ohio, Indiana and Illinois, and in most of the older states, the margin of omissions exceeds the duplications and errors exaggerating results of not less than 2 or 3 per cent., and in the range states extending from western Kansas to the Pacific the margin of omission is from 20 to 25 per cent., and for the nation not less than 5.

The margin of error in staple crops, such as corn and wheat, is not, however, much, if any, greater than 1 per cent., and for minor crops, dairy products, poultry, etc., much greater, approximating 10 per cent.

The margin of error in the office work of the census due to errors in schedule revision, tabulation, result work, etc., varies from .1 to .5 per cent.

*Requisites in Crop Reporting:* H. PARKER WILLIS, Washington, D. C.

The subject of crop reporting is of special interest at this time because of some dissatisfaction in the business world concerning the service now available. Within recent years there has been a lack of faith in the work done by the government offices, and this has rendered it of more than usual importance to study the methods of developing such a service along proper lines.

The first requisite in establishing a crop-report service is honesty in the officials in charge. This statement implies not mere personal honesty, but scientific truthfulness, freedom from bias and a display of the scientific spirit. As incidents to the attainment of these qualities the officials in charge of any crop-report service should of course be free from any pecuniary interest in that service, and devoid of bias in favor of any particular class in the community. They should not be permitted to

speculate on the exchanges where those products which are affected by their reports are listed. Furthermore, the force working under them should be free from bias, and should be selected upon civil service principles, promotions being made after a non-partisan method. This applies not merely to the force in the office, but also to the outside force of correspondents, who ought not to represent any particular class, but should be selected in such a way that any bias manifested by any one class will be offset by the bias shown in the returns furnished by another. The returns should be absolutely public and should be furnished to all persons simultaneously. They should be public, not only as regards results, but as regards methods. In collecting the figures there should be an effort constantly to look for actual facts rather than for opinions. In other words, crop returns should, if possible, not be estimates at all, but should be representative of exact facts. Correspondents and all employees should be paid, for in this way more accurate and reliable results are obtained. The government should certainly not publish estimates. If, however, it is to do so there should be such a relationship between the office through which the basis for the estimates is obtained and the office furnishing those estimates, as to insure harmony of result.

*Some Views of Recent Sociology:* JAMES H. BAKER, president of the University of Colorado.

One conclusion is justified, namely, that social progress can not rely upon natural selection alone, but must bring to its aid all the forces of material and physical betterment, of public opinion, law, morality and religion.

Democratic government is the servant of the people; the will of the people can con-

trol its character and its tendencies; it is the necessary machinery for bringing about many reforms; and a people who have not the virtue and active energy to effect reforms through government are incapable of accomplishing them through any other organization of society or lack of organization.

Individual responsibility in social reform can not be too strongly urged. *Laissez faire* is materialism, fatalism, selfishness, savagery, indifference, laziness, mere subjective religious life and Pharisaism. It is the priest and the Levite, and not the Samaritan.

We may dismiss anarchism and revolutionary socialism at the outset. Even if in a distant age government control can be largely relaxed, abolition of government to-day, human nature being as it is, would necessitate the gradual reestablishment of government through a chaos and struggle which would be a repetition of Middle Ages history. Did we have the social state to-day, human nature being what it is, we should have under another form of organization an exaggeration of all the political corruption and selfishness and weakness which exist under present forms of government. In all civilized countries political changes will be an evolution and not a revolution. We may throw aside all supposed absolute rights and inflexible principles. Let the state do what it can do better than individuals.

Certainly we must recognize many causes of poverty. It is harmful to make a hobby of any one theory, or to try to find a panacea in any one remedy. Unwillingness may be subject to state regulation; lack of thrift, prodigality, etc., may be modified by philanthropic endeavor; inability can be removed in a percentage of cases by education and by the influence of such work as that of the 'settlements'; lack

of opportunity for work can be met in part in times of distress by state or municipal provision for needed public improvements; various kinds of misfortune should be met by state provision and organized philanthropy; hopeless pauperism should be the state's care; inequitable distribution will be gradually modified by labor organizations and the development of altruistic principles in society. There is much of poverty that no plan of state or society can remove until the tone of the whole social organism is improved. I refer to the lack of aims and motives in those who are otherwise physically and mentally capable. The world is full of opportunities for establishing in thousands of centers, productive industrial activities, if the unemployed had the power of initiative. This whole subject is related to the problem of degeneracy.

That monopolies, so far as harmful in fact and tendency, should be subject to control is, I believe, the growing theory. The findings of the United States Industrial Commission, which has recently finished its labors, are significant, especially as the commission can not be charged *a priori* with undue hostility to wealth. These findings show the need of control through government, and the belief in its possibility and feasibility. Moreover, the very fact of the report shows that specialists, statesmen, and even politicians and monopolists are awake to the fact that reform must come.

In spite of certain biological doctrines of social evolution, in spite of the advocates of struggle, in spite of all *laissez faire* theories, one important fact must be recognized, namely, that human sympathy is growing and that human sympathy must be preserved in all its strength and purity; it is the bond that unites the units into a social aggregate. At the same time it is conceded by all scientific philanthropists

that, as struggle is modified by altruism, the unfit of every description are preserved to the detriment of the race as a whole, and that some humane solution of the difficulty must be sought. The burden of the state is becoming such that the causes of degeneracy must be in large part removed. The very fact that state and society are assuming the care of the unfortunate shows the growth of altruism and a recognition of the solidarity of society. The dependent, defective and delinquent classes are beginning to receive attention and study commensurate with the importance of their effect upon the welfare of the whole social fabric. Since all degeneracy is due to heredity or environment, state and society can reach and to some extent regulate the causes.

Since the struggle in human society is bound to be lessened, and race degeneration will surely follow unless degenerate tendencies are eliminated, what is the aspect of the problem? Society will no longer allow the unfortunate to perish. The answer seems to me plain and simple. Dickens in his marvelous study of social problems emphasized with terrible vividness the evils of society from neglected children when these should become grown and trained in vice, and hence powerful for harm. The work of improving the lower strata of society must begin with children. Educate the normal children of the poor, teach them some trade and start them right in life. Educate all who under right influence and training can become useful citizens. Remove waifs from unwholesome surroundings, or, rather, improve the surroundings. But in the name of humanity place all those who by nature must become hopeless paupers, imbeciles, all who by nature will become hopeless criminals, under permanent custodial care. Teach them some simple occupation and make them in

part self-supporting. Segregate the sexes, that such unfortunates and society may be spared the fatal gift of degenerate offspring. This will do more to regenerate society than use-inheritance and all remedies proposed, except the great moral evolution of the race as a whole which I believe is going on.

*Growth of Great Cities:* ELMER L. CORTHELL, New York city.

At the annual meeting of the association held at Springfield, Mass., in 1895, the author offered a paper with a similar title.

The present paper gives the necessary summary of the former, and extends the curves of the diagram of growth and the data generally to include the census of 1900.

The growth of the eight cities under consideration is shown by a curve, the basis of which is the following: the periods from the earliest obtainable data to 1900 are measured from the ordinate, and the population of each census is measured from the abscissa.

It has been the aim of the author to show in the case of each city its *metropolitan* population; not simply that included within its political limits, but, in the case of London and Berlin, Greater London and Greater Berlin are also given.

The author gives a *table* of populations in addition to the curves of the diagram, to show the data for his latest extension of the curve of growth.

City.	Date.	Popula-tion.	Rate of Increase.
London.....	1900	4,589,129	8.6%
Greater London.....	1900	6,652,145	20.0
Paris (Greater).....	1901	3,599,991	18.0
St. Petersburg.....	1897	1,132,677	15.5
Berlin.....	1900	1,884,157	12.0
Greater Berlin.....	1900	2,512,523	19.0
Vienna.....	1899	1,639,811	11.0
Philadelphia.....	1900	1,369,632	23.0
New York (Greater) ..	1900	3,833,999	37.0
New York (Manhattan Borough).....	1900	1,850,093	29.0
Chicago.....	1900	1,838,735	54.0

The populations for the extreme or latest points on the curve are given above:

Likewise there is given with the above table the present rate of increase in population per decade; there is also stated the special features of each city—its area, density, etc.

As to density of population, this is shown graphically by squares on the diagram.

The comparisons in figures are as follows:

*New York.*—Maximum density, 630,740 per square mile on 3.6 acres. Average maximum density, 480,000 per square mile

*Philadelphia.*—Average density, 8,091 per square mile, area 129 square miles.

*Chicago.*—Average density, 8,430 per square mile, area 186 square miles.

The data for density were obtained about 1894.

A prediction is made of the population of each city in 1910 and 1920, taking into consideration important factors which are likely to change the present rates of increase, such as, first, the changes which new methods of transportation may bring about, either taking people more quickly and cheaply into cities, or out of them into more distant districts now open areas or sparsely

City.	The Author's Estimated Population for 1900.	Actual Population, 1900.	Estimated Population in 1910.	Estimated Population in 1920.
Greater London.....	6,496,000	6,652,145	7,490,400	8,516,256
London.....	4,599,800	4,589,129	4,967,784	5,315,528
New York (Greater).....	3,900,000	3,833,999	4,953,000	6,191,250
		1901		
Paris.....	2,697,300	2,660,559	2,967,030	3,234,063
Greater Paris.....		3,599,991	4,139,990	4,759,589
Berlin.....	2,101,400	1,884,157	2,731,820	3,496,729
Greater Berlin.....		2,512,523	2,914,517	3,322,549
*Greater Chicago.....	2,400,000	1,838,735	2,574,229	3,475,209
Philadelphia.....	1,414,500	1,369,632	1,697,400	2,002,932
St. Petersburg.....	1,185,600	1,132,677	1,339,728	1,500,495
		1897		

on 320 acres. Average density, New York city proper, 40,000 per square mile on 37 square miles.

*London.*—Maximum density, 132,000 per square mile on 357 acres. Average density (registration London), 37,000 per square mile on 117 square miles.

*Paris.*—Average density, 79,300 per square mile on 31 square miles.

*St. Petersburg.*—Maximum density, 227,276 per square mile. Average density, 28,260 per square mile on 35 square miles.

*Berlin.*—Maximum density, 92,600 per square mile. Average density, 67,612 per square mile, area 23.4 square miles.

\* *Chicago.* The erroneous estimates of population in 1894 require revision of prediction.

settled country. Second, the congesting or overcrowding of city areas, making them too dense for comfort or health. These two conditions are already producing changes of magnitude in population. London is an instance of these effects, or of some others possibly; several of the central districts, instead of showing an increase, showed actual decrease in the last two census epochs.

It is difficult to predict now what change will take place in New York during the succeeding decades by the contemplated transportation changes; such as the opening of the new bridge over the East River, probable completion of the old Hudson River tunnel, the construction of the Rapid

Transit Subway lines, the electrifying of the Manhattan Elevated and the extension of electric lines into the suburbs, and particularly by the construction of the Pennsylvania Railway's proposed tunnel under the rivers and New York, connecting New Jersey and Long Island with the central district of New York city, and additional facilities for handling passengers at the Great Central Depot and transferring them to the Subway.

It is not safe in such predictions to use *estimates* of population—nothing but the actual count by a census should be used.

In 1895 the author was led astray by estimates of Chicago's population, and these erroneous estimates vitiated his predictions of population in 1900, 1910 and 1920. In cases where he based them upon reliable official returns his predictions were not far wrong for 1900.

As this feature of the paper is one of special interest, the table of predictions and its comparison with the actual populations of 1900 is given in full in this synopsis.

The author's object in obtaining the data and in writing the two papers for the association—one in 1895, and the other in 1902—is to furnish information that may be of use in solving some of the important transportation, economical and social problems relating to the great masses of humanity assembled in those great cities of over one million inhabitants.

In compiling a paper on the subject in 1910, it will be necessary to add several cities to the list in Great Britain, the United States and Argentina. Buenos Aires is likely to have a population of a million by the year 1906.

*The Pan-American Union and the Bureau of the American Republics:* Hon. W. W. ROCKHILL, director of the Bureau of American Republics.

The International Union of the American Republics, popularly known as the Pan-American Union, has existed since 1890. It was established by the International Conference of 1889-90, with the Bureau of the American Republics as its organ. The reason for its creation was the fostering of the friendly relations between all the republics, the dissemination of more general knowledge of the social and economic conditions obtaining in the various portions of the Western Hemisphere and for improving business intercourse and trade relations. In 1893 the publication of a monthly bulletin was inaugurated. It is a magazine published in the English, Spanish, Portuguese and French languages, containing information regarding the industries, trade, manufacture and general resources of the several republics. Its edition is 11,000 copies. The demand for these has been great, especially from the public schools of the country. An important work of the bureau is the publication of maps of the several republics on a uniform scale, giving general geographical as well as economic features, railway and telegraph lines, etc. A code of commercial nomenclature containing more than 50,000 terms in English, Spanish and Portuguese has been published by the bureau. The first international conference provided that the union should continue in force for ten years, and indicated the manner of its further continuance. It is now in the second decade of its existence. It was early recognized that the lack of an agency to carry on the work initiated by the first international conference was one of the chief reasons why it did not accomplish as much as its projectors anticipated. It was, therefore, determined by the second conference, held in Mexico in 1901-2, to reorganize the bureau, or rather to broaden and expand its existing organization. The

name was changed to the International Bureau of the American Republics, and its affairs placed under the supervision of a governing board composed of the Secretary of State of the United States, who is chairman, and the diplomatic representatives in Washington of all the other American republics represented in the bureau—in other words, of all the American republics—numbering twenty. The bureau is supported by contributions from all the republics in proportion to the number of inhabitants. Under the new plan the bureau corresponds, through the diplomatic representatives, with the executive departments of the several governments. It furnishes information to any of the republics requesting it. Each of the republics sends to it two copies of each of its official publications, and supplies such information as may, from time to time, be requested by the director. All of the publications of the bureau are public documents and as such carried free in the mails of all the republics. The bureau is the custodian of the archives of the international American conferences, and is charged with the performance of any executive work specially imposed upon it by the conferences. Among the duties was the fixing of the date of meeting of the commission for the study of the coffee crisis, and the sanitary and customs congresses.

The necessity of forming a good library, especially of the official publications of the American states, was recognized by the conference which founded the bureau. It originated with the idea of creating a monument to the work of the conference. The second conference by resolution designated the library as the 'Columbus Memorial Library.' It has about 10,000 volumes, chiefly of works on Latin America. The scope of the work of the bureau does not yet seem to have been limited definitely,

and it is believed that in the future it may be found useful in many ways.

*Work of the Bureau of Insular Affairs:*  
Col. CLARENCE R. EDWARDS, chief of the Bureau of Insular Affairs, War Department.

At the close of the Spanish War, the War Department was brought face to face with a unique problem, *i. e.*, the establishment of a properly qualified civil government under military control in the surrendered territory, a territory that speedily included Cuba, Porto Rico and the Philippine Archipelago. The functions of an organized government, in harmony with American methods, had to be set in operation in an unpromising field. In a day almost, the United States was called upon to govern more than twice as many people as inhabited the United States at the close of the Revolution.

The War Department found itself without adequate machinery to handle this new work. Its bureaus were adapted to military requirements, while the new conditions extended to all classes of government affairs.

The chief clerk of the War Department states that, for the sake of ready reference, the earliest Cuban customs cases, being foreign to even the miscellaneous class of records filed in the long-established record division, were filed on his own desk. On December 13, 1898, there was created in the office of the Secretary of War the 'Division of Customs and Insular Affairs,' which has recently grown into the Bureau of Insular Affairs.

There is no more important branch of the bureau than the legal questions that have arisen. These questions develop a broad field for investigation, including the law of military occupation; the laws and usages of civilized warfare; international

law; interpretation of the constitution of the United States; interpretation of treaties respecting the territories subject to military occupation, etc.

Some of these many questions could not be disposed of by adherence to rules already established by judicial decisions. It was, therefore, necessary to extend the investigation into the field of history and see if the same or similar questions had arisen in the several instances of previous acquisition of foreign territory by the United States, and to learn how the question had been dealt with by the legislative and administrative branches of the government of the United States.

*The Consular Service and Foreign Trade:*

Hon. FREDERIC EMORY, chief of the Bureau of Foreign Commerce, Department of State.

A paper on the above subject was contributed by Frederic Emory, chief of the Bureau of Foreign Commerce, Department of State. That bureau has charge of the publication of consular reports on commercial and industrial subjects, from all parts of the world, and in recent years has greatly improved the efficiency and promptitude of this service.

Mr. Emory begins by quoting a recent address of Sir Edmund Monson, the British Ambassador to France, to the effect that the expansion of modern commerce and the many international questions it has created have had a strongly modifying influence upon diplomatic profession, which, instead of political intrigue, as in olden times, devotes itself now almost exclusively to business considerations.

If this be true of diplomacy, says Mr. Emory, it is even more generally applicable to the consular service. Diplomats are stationed only at the capitals of nations, but consular officers are found at all the

important trade and industrial centers, and are thus brought into closer touch with the daily activities and currents of trade. For this reason they are usually in a better position to report the practical details so often wanted by a home industry or a mercantile house engaged in foreign trade. In the old days the consuls of European powers were usually selected with reference to their social qualities and general culture, and without much consideration of their possible usefulness to trade. In these days of sharp competition among the great producing nations, the business capacity and zeal of the consul in collecting information are found to be not only essential, but often a determining factor in the growth of commerce.

Mr. Emory's contention is that the United States consular service has been found to be superior to those of the other powers as a trade agency, for the very reason that the persons selected as consular officers being average Americans, as a rule, have had more of business aptitude than any other quality and have seldom been deterred by social considerations from giving their attention to 'trade.' Frequent complaint has been made of late in Great Britain that the English consular service has become very largely a caste or polite profession, instead of being what is now more urgently required—an active, wide-awake corps for the collection of commercial intelligence. It is precisely in this branch of work that the United States consular officers have shown themselves to be particularly alert and efficient. Mr. Emory argues from this state of facts that it would be unfortunate, in the reorganization of our consular service, to revert to the social or intellectual exclusiveness found by Europeans to be no longer justified by existing conditions, and that the logic of our experience incontestably proves the im-

portance of giving the greatest weight to the business capacity and general intelligence of the individual consul.

*The Relation Between Exports and Imports:* Hon. T. E. BURTON, U. S. House of Representatives.

In determining the wealth or prosperity of a country nothing is more generally noticed than the relation between exports and imports, the so-called 'balance of trade.' An excess of exports is regarded as indicating prosperity. Yet, independently considered, nothing could be more misleading. In order to ascertain the significance of this relation it is necessary to consider a number of circumstances, chief among which are the condition of the country in question, whether a debtor or creditor country, in which connection the income derived from loans and investments in other countries, as well as from shipping engaged in international carrying trade, must be taken into account; the stage of development; the quality of imports and the uses to which they are applied, particularly whether they be raw material to be utilized in manufacture, or other material to be employed in increasing the productive power of the country. In the final analysis, the comparative utility of that which is received and that which is disposed of must be determined, regardless of valuations.

Countries receiving tribute or contributions from other lands, like Rome in the days of its supremacy, or Germany after payment of the French indemnity, show a large excess of imports.

In the United Kingdom the great excess in the value of imports is approximately equaled year by year by the income from investments abroad, and the carrying trade. In new countries rich in resources, exports naturally exceed imports, but when a developing stage begins much material is

imported from more advanced countries. Imports increase until the improved equipment for production acquired by large importations makes itself felt in excess of exports again.

After due allowance has been made for all these modifying circumstances and exceptions, the fact remains that a country importing largely in excess of its exports, when such excess is not derived from the income of a surplus accumulated in the past, or is not devoted to development for the future, gives sign of economic decay.

The annual excess of imports in countries furnishing commercial statistics is more than one billion of dollars. This excess, though made up partly of carrying charges and profits of trade, where these items are counted in the valuation of imports, can only be explained by the superior utility of commodities in the countries into which they are imported, a fact which necessarily influences valuations.

The phenomenal excess of exports of the United States during recent years can only be explained by realizing that we have gained a new position as the purveyor of the world's wants. It is impossible that this great disparity of exports can continue. There is an inevitable tendency, whenever a nation obtains great accretions of wealth, to increase purchases abroad. In the last two years the excess has been diminishing, but other favorable indications appear in the relation between exports and imports, such as the increased proportion of raw material imported for manufacturing. In our foreign trade, as well as in all other ways, all signs point to the assured supremacy of the United States.

*Tropical Development a Necessity of World Progress:* Hon. O. P. AUSTIN, chief of the Bureau of Statistics, Treasury Department.

The principal suggestions of Mr. Austin's paper were:

1. That the increasing population of the world and the increasing facilities for transportation require that its various sections shall contribute their proper proportion to the requirements of man.
2. That the world, and especially the temperate zones, is constantly increasing its demands for tropical and subtropical products.
3. That although the belt lying between the thirtieth parallels of north and south latitude contains practically half the land area of the world, it contributes but one sixth of the exports which enter into the international commerce of the world.
4. That conditions in the temperate zones are such as to render available surplus capital, energy and experience which may now be devoted to the development of the tropics.
5. That recent discoveries for the protection of life and health in the tropics, and the use of natural power, will now enable the temperate-zone man to accomplish many things in the tropics not possible in earlier years.
6. That those sections of the tropics in which the native labor supply is insufficient may be readily supplied with the necessary amount of tropical labor from India, southern China and other sections of the Orient whose populations have shown themselves capable of and willing to labor in the tropics.
7. That the development of comparatively recent years has brought practically all of the tropics, except tropical America, under control of temperate-zone countries, thus facilitating the application in the tropics of the capital and energy of the temperate-zone man.

*Economic Operations of the Treasury Department:* Hon. MILTON E. AILES, Assistant Secretary of the Treasury.

The economic operations of the department relate chiefly to the management of the revenues. In the public mind this part of the treasury work is what makes or un-makes a secretary of the treasury. The world little knows or cares how heavily burdened that officer may be with the management of the customs (unless he examines baggage over-zealously) or how a secretary of the treasury lies awake at night devising ways and means for stamping out the latest yellow fever epidemic, or is harassed with the intricacies of constructing innumerable public buildings or caring for more than three hundred already in existence. When storms ravage the coast it is the Secretary of the Treasury who prays that not one of the keepers of his 1,200 lights and lighthouses may have failed, or that any of the surfmen of the life-saving service have been found wanting in courage at the supreme hour. It is the Secretary of the Treasury who must know that navigators' charts from the Coast and Geodetic Survey are correct, that the Steamboat Inspection Service has done its work faithfully, and, in fact, that all of the 26,000 employees accredited to his department and engaged in its many and varied services are faithful to their trusts. And yet, he must keep his fingers on the pulse of government receipts and disbursements. He must observe an approaching deficiency and give timely warning to congress, or arrange for public loans, in order that the treasury may be replenished and strengthened. In the days of prosperity he must also observe the phenomena of a surplus. Accumulating funds in the treasury mean withdrawals of money hitherto profitably employed in trade or business, and so he must set about to apply a remedy.

Under our system government revenues increase when business is most active throughout the country. The result, unless carefully guarded against, is a lock-up of money in the treasury just when it is most needed elsewhere. When the crop-moving time comes in the fall, and the great money centers are sending currency to interior points, the treasury is bombarded with requests for relief. As the rates for money advance, the cry becomes louder. For more than half a century now, it has been the established policy of the government to heed that cry, especially when it is apparent that the treasury itself is a disturbing factor. Recent experiences demonstrate what must and should be done so long as our system permits the hoarding of funds in government vaults, and so long as that situation is complicated by an unsatisfactory bank-note circulation not related to the expanding and contracting wants of commerce. Within the past few months the Secretary of the Treasury by extraordinary efforts succeeded in stimulating national banks to take out some \$25,000,000 additional circulation. He also increased the amount of public funds which national banks are permitted to hold by \$24,000,000. He anticipated the payment of interest on the public debt for October and November without rebate, and for the whole of the fiscal year, to such as cared to avail themselves of the offer, subject to a rebate of two tenths of one per cent. a month, by means of which latter method he succeeded in paying out \$3,000,000 more, with a profit of over \$40,000 to the treasury; and finally, when the business of the country demanded still further relief, he anticipated a portion of the public debt itself by buying bonds and thus releasing some \$23,000,000. By the time the crop-moving season was over the amount of cash actually locked up in the treasury had been reduced

by nearly \$50,000,000, and there was left in the treasury vaults only a little over \$50,000,000, which tradition and practice have established as a fair working balance. The responsibility for managing the public funds is a heavy one, but it has been met at all times, and under all administrations, by every Secretary of the Treasury, with high courage and devoted effort to keep the treasury as near as may be out of the business world, to avoid the well-recognized evils that exist, and to take advantage of all the good there is in our present national financial system.

*Effects of the Inflow of Gold:* Hon. ELLIS H. ROBERTS, Treasurer of the United States.

The stock of gold in the United States shows for four years an annual average gain of \$107,783,639. All the countries of Europe show such a gain less by \$12,358,639. In per capita the stock of gold in this country is greater than anywhere else, except in France and South Africa. The treasury of the United States holds \$615,000,000 and gained \$412,450,562 in five years, while all the official banks of Europe taken together in the same period lost \$37,477,102.

Upon such treasures our currency rests solid and impregnable. An attack on our reserves may be conceived, but it would be to besiege Gibraltar with carbines. The inflow of gold has, since July 1, 1897, added an average of \$78,238,512 every year to our circulation. Here lies possible peril. Inflation of currency incites to dangerous expansion of business. No one will suggest that the incoming of gold shall be stopped; but can not paper currency be reduced in dull seasons?

Prices of commodities have advanced, and wages have followed a little after. How do these conditions affect our world

relations? With our stock of gold, our official holdings, and our gold in circulation exceeding those of any other country, and growing more rapidly in gross and per capita than those of any other people, this land becomes more and more the home of gold. The solidity of our financial system adds much to the strength of the United States in commercial credit, general esteem and international politics in all the world. We fear no evil from exports of gold, for we can spare more than Europe can pay for.

Has inflation of currency, of prices and wages gone so far as to check our exports? In agriculture crops at home and abroad determine shipments. Prices and quality control exports of manufactures. In the first ten months of 1902 we sold abroad more manufactured articles than in any like period except 1900, and they were 32.63 per cent. of our total exports, the largest on record. The inflow of gold is not without its hazards. They must be avoided. The American people are sane enough to make gold not only the symbol of prosperity, but its stout defense.

*Monetary Reform:* Hon. GEORGE E. ROBERTS, director of the Mint.

Mr. Roberts's paper was chiefly devoted to bank-note issues upon ordinary commercial assets. He said in part:

The objector to note issues without special security wants first of all to divest himself of the idea that note redemption depends solely or primarily upon the gold reserve in the banks. That is a reserve and guarantee fund, but the regular redemption of a scientific bank-note currency is through a clearing house by a system of offsets. Under the Fowler Bill, now pending in Congress, each bank would send the notes of other banks that came to its counter to its correspondent in the clearing-house city of its district. It would have

a double object in doing this: (1) It would prefer to pay out its own notes instead of theirs, and (2) it would do it to have an offset to its own notes in the clearing house and to build up its gold reserve there. The whole plan is simply a further development of the clearing-house idea as we have it in operation for drafts and checks. It is a further economy in the exchanges, a further substitution of an inexpensive medium.

So long as a bank confined its note issue to the service of its regular daily, legitimate trade, to giving the ordinary accommodation to farmers, manufacturers and merchants in their business, there would be no important balances against it at the clearing house, because the legitimate trade of the country offsets itself. But as soon as a bank began greedily to push its circulation by unusual methods or unusual credits, adverse balances at the clearing house would begin to appear and its gold reserve to dwindle. So long as a bank did only the business that a bank ought to do, redemption would be no problem at all, but the moment it departed from that policy, it would have to suffer and settle at every misstep.

It is a familiar fact that the fall of every year brings tight money in the United States, due to the moving of crops and the activity of trade. There is need of more currency, more instruments of exchange, in that part of the year than at any other time, and our monetary system does not respond to such special demands. When money is easy it accumulates in the centers, fosters speculation and becomes more or less engaged there, and then when the fall demand comes on, there is a wail over its withdrawal because it forces liquidation and unsettles business. These credit notes of local banks would not be likely to have general circulation, for the reason that the

banks of each locality would keep their neighborhood clear of foreign currency. They would not accumulate in the centers because they would not be good in the reserves of the city banks. They are not available as a basis of credit. They can be used only as a circulating medium. This distinction between the bank note and our other forms of paper money is the feature to which attention is directed. It follows from this and from the experience of similar systems that the local banks all over the country would have in ordinary times a reserve of circulation to put out whenever business was active enough to absorb it. The volume of circulation would naturally expand in the fall of the year and contract as business slackened.

*Inflation through the Expansion of Bank Deposits:* Professor JOSEPH FRENCH JOHNSON, New York University.

Professor Johnson pointed out that bank deposits are of two classes. (1) Those which result from a deposit of cash or of checks and drafts with a bank. These he styled cash deposits. (2) Deposits which are the result of a credit operation, the borrower taking, not money, but a deposit account. These he called credit deposits. The cash deposits can not be increased at will by the banker. They represent the savings of a community, wealth that has been produced and is not wanted by the producer. The credit deposits may be increased at the discretion of the banker. They represent savings in the process of being made, wealth being produced. Both classes of deposits give rise to a large mass of checks and drafts which constitute a medium of exchange known as deposit currency. Inasmuch as bankers have some discretion in the expansion of their credit deposits, the supply of deposit currency in

a country is always dependent upon the policy pursued by the banks. Through an unwise expansion of their credit deposits banks are able to bring about a very dangerous increase or inflation of the deposit currency. In good times, when a speculative spirit easily gets possession of business men, bankers are always liable to encourage speculation, and the consequent rise of prices, by the expansion of their credit deposits, and a larger portion of the country's monetary stock, is drawn into the banking reserves as a basis for the extended credits. The increase of the banking reserve, it should be noted, is very slight in comparison with the concurrent increase of the deposit currency. Inflation of the medium of exchange in this way is more dangerous and can be carried to greater length than any inflation possible through a free issue of bank notes. In the case of bank notes an automatic check operates to prevent an over-issue. A definite amount of hand-to-hand money is wanted by the community, and if any excess is put into circulation, it speedily finds its way back to the issuing bank. No such instant automatic check is applied in the case of inflation through an increase of deposit currency. A brake is always applied, but not promptly. An undue inflation of deposit currency inflates prices quite as effectively as an increase in the stock of money itself, and so finally disturbs our foreign trade relations, bringing about a balance of indebtedness that renders the export of gold necessary. This export of gold forces bankers to contract their operations and often brings injury upon men whose business enterprises are in every respect deserving of assistance.

FRANK H. HITCHCOCK,  
*Secretary.*

(To be concluded.)

*THE EDENTATA OF THE SANTA CRUZ  
BEDS.\**

IN the Santa Cruz fauna the edentates form one of the most conspicuous elements, both in the abundance of individuals and in the number and variety of the genera and species. As a whole, they are strikingly different from those of recent times, for of the three orders which are represented among the fossils, armadillos, glyptodonts and ground-sloths, only the first-named persists to the present day, the other two being extinct. On the other hand, no trace has yet been found in the Santa Cruz beds of the true sloths or of the anteaters. It can hardly be doubted that both of these orders had already become differentiated and were in existence as such. If so, however, they must have originated in some other part of the South American continent, and were prevented by climatic or other barriers from extending their range into Patagonia. One fact which clearly justifies this assumption is the relatively small degree of structural change that took place between the edentates of the Santa Cruz and those of later periods, such as the Pampean. There are many differences of detail between the earlier and the later forms, but nothing comparable to what would be implied in the derivation of the sloths or anteaters from any known Santa Cruz fossils.

As will be shown more at length in a later section, much the same statement applies to the armadillos of the Santa Cruz beds, with reference to their connection with those of modern times. Speaking broadly, the latter would appear not to have been derived from the former, which suggests that Miocene Patagonia was rather an outpost of the South American

\* From the forthcoming Vol. V. of the 'Reports of the Princeton University Expeditions to Patagonia.'

fauna than the main area of its development.

The Santa Cruz glyptodonts are, on the whole, markedly more primitive than those of the Pampean, and in many structural details show a closer connection with the armadillos than do the latter; but for the most part, the Santa Cruz genera do not appear to be directly ancestral to those of the Pampean. Like the armadillos, they seem to be aside from the main lines of descent which terminated in the giant types of the Pleistocene.

On the other hand, the Gravigrada appear to be more directly ancestral to the great Pampean forms, and representatives, if not the actual ancestors, of almost all the genera may be observed in this fauna. However, no entirely convincing solution of these problems can be obtained until the fossils intermediate in time between the Santa Cruz and the Pampean are more fully known.

A remarkable feature of the Santa Cruz edentates is their variability within certain well-defined limits. As a rule, the genera may be readily identified, but the species, especially of the Glyptodontia and Gravigrada, present extraordinary difficulties to the systematist. This variability, however, confines itself to comparatively unimportant details, and the characteristics of the three orders and of the families and genera within those orders are already, for the most part, firmly established, though transitional forms from species to species and, less commonly, from genus to genus abound.

1. The Santa Cruz edentates are relatively small animals and a few of them are really minute. As compared with the ground-sloths and glyptodonts of the Pampean, they are pygmies, but the armadillos have a greater number of large species than exist at present, though none of them

is gigantic, or comparable to such a form as *Macroeuphractus*.

2. Fully developed carapaces are found in all of the armadillos and glyptodonts of the period, but as yet no dermal ossifications have been found in connection with any of the ground-sloths. This is the less surprising, because very little is known of the skeleton of the Santa Cruz *Mylodontidae*, the only family in which these ossifications could be expected to occur.

3. The teeth are in all cases devoid of enamel, rootless and tubular, though they may be lobate, examples of which occur in all three of the orders. No trace of a milk-dentition has been observed. Premaxillary teeth and the corresponding mandibular teeth have been definitely found only in the armadillos, though rudimentary traces of such teeth are apparent in some of the glyptodonts and they may also occur in a few of the ground-sloths.

4. The skull has few common features throughout the series, each order having its own characteristic type of structure. The difference is largely in the relative development of the cranial and facial regions, which varies from the extremely elongate skull, with long, slender rostrum, of the armadillos, to the short, broad, deep and almost cubical skull of the glyptodonts. Sagittal and occipital crests are never very strongly marked, but they are present in most genera of all three orders, and there is no such development of cranial air-sinuses as took place at a later period. In all of the known genera from this formation, except *Peltophilus*, there is a more or less prominent descending, suborbital process given off from the zygomatic arch; it may be formed by the jugal alone or by the jugal and maxillary, and in position it may be at the anterior or the posterior end, or in the middle of the arch. The arch itself is always complete, never rudi-

mentary, though in the Gravigrada the jugal is usually loosely attached, and has been lost from most of the specimens.

5. The neck has never more or less than seven vertebræ, though in all of the armadillos and glyptodonts the apparent number is much reduced by coossification. In the same two groups the trunk is short and the number of trunk-vertebræ small, and in the glyptodonts these vertebræ are coossified into long 'tubes,' one thoracic, the other lumbo-sacral. In the Gravigrada, on the contrary, the trunk is very long and the trunk-vertebræ numerous. In both armadillos and ground-sloths the lumbar and posterior thoracic vertebræ have very complex accessory zygapophyses, which in the former are as fully developed as at the present time, but in the latter are somewhat less so than they became at a later period. The sacrum may be long (*Dasyprocta*, *Glyptodontia*) or short (*Gravigrada*), but always articulates with both ilia and ischia. The tail is sometimes of moderate length and sometimes very long, but always heavy and always has a complete series of chevron-bones.

6. The limbs and feet differ greatly in the three orders, and have comparatively little in common. The scapula is broad and has an extremely prominent spine and acromion; the coracoid is very large in the ground-sloths, reduced in the glyptodonts and armadillos, except *Peltophilus*. In all three orders the humerus has a similar general appearance, having small tuberosities, extremely prominent deltoid and supinator ridges and internal epicondyle, while the foramen is large. Ulna and radius are separate and, except in the ground-sloths, the former has a very large olecranon. All the carpals are free, but no genus has been found which has the centrale. The manus is pentadactyl and plantigrade, though it is not improbable

that the Gravigrada had already begun to rest the ulnar edge of the hand upon the ground; the metacarpals are free and, except in one species of armadillo, none of the phalanges are coossified. The unguals are generally longer and more pointed than in the pes.

The pelvis differs much in the three groups, but always the ischia are extensively connected with the sacrum. The femur is long and has prominent trochanters, and in some of the armadillos the great trochanter reaches extraordinary proportions. Tibia and fibula are free in the Gravigrada, coalesced at both ends in the glyptodonts and armadillos. The pes is pentadactyl and, except in the glyptodonts, is plantigrade, while in the latter group it is semidigitigrade. No coossification occurs in tarsus, metatarsus or phalanges, and the unguals, which in the ground-sloths are large claws, in the other two orders are more or less hoof-like, completely so in the glyptodonts.

#### DASYPODA.

The Santa Cruz armadillos form a peculiar assemblage of types, very unlike, as a whole, the modern representatives of the suborder, for only one, or possibly two, species would appear to be directly ancestral to existing forms, while the majority belong to extinct lines. Some of these lines, like that of *Proeutatus*, for example, persisted till a much later period than the Santa Cruz, and reached their culmination in the Pampean, but have no representatives in the recent fauna, while other series, like *Stegotherium* and the extraordinary *Peltophilus*, are not known to pass beyond the limits of the Santa Cruz formation. At the same time, there is a very notable diversity among these armadillos, and no less than three families and seven genera have been described, most of

the genera having each several species. The discovery of more complete material may reduce these numbers, but the variety will continue to be remarkable.

Attention has already been called to the difference between the Santa Cruz and the recent armadillos, a difference which can be made clear in a few words. No probable forerunner of *Dasypus*, *Priodontes*, *Tolypeutes*, *Chlamydophorus* or *Tatu*, has been found in these beds, though some one of the species of *Prozaëdius* was almost certainly an ancestor of the recent *Zaëdyus* —it is possible, though far from certain, that some species of *Stenotatus* stood in the same relation to the modern *Cabassous*. In view of the stage of differentiation attained by the Santa Cruz armadillos, it is most improbable that all of these modern types should have originated since that period. This confirms the conclusion indicated by several other mammalian series, that in Miocene times Patagonia was not the principal theater of evolution of the South American fauna. This would explain the entire absence from the Santa Cruz beds of many types which would naturally be expected to occur there.

In general, the armadillos of this period may be said to have attained nearly the modern degree of specialization, though, in many details, primitive characteristics have been retained. As Ameghino has pointed out, the carapace never has an anterior buckler, but is made up of movable, imbricating bands, except posteriorly, where a larger or smaller number of plates are joined together by their edges to make the pelvic buckler. In one genus, *Praeuphractus* (*fide* Ameghino) there is no pelvic buckler, all the plates being movable, and it is uncertain whether this was not also true of *Stegotherium*. In *Peltophilus* the pelvic buckler would appear to have been very loosely formed, the plates merely

touching one another, though in this region they are not imbricating. The cephalic shield is usually composed of numerous small, non-imbricating, irregularly polygonal and rather heavy plates, which are finely pitted, but display no regular sculptural pattern, but in the altogether exceptional genus *Peltephilus* these plates are large, very thick and coarsely sculptured. A further remarkable peculiarity of the head-shield in this genus is the presence of one or two pairs of pointed, horn-like scutes upon the rostrum. It is a curious fact that no plates of the tail-sheath have been found in association with any of the genera, except *Peltephilus*. It seems most unlikely that all the other genera had unarmored tails, and yet, in view of the large number of well-preserved specimens, including the caudal vertebræ, that have been collected, it is possible that such may have been the case.

Considerable variety is displayed in the dentition, though in no species has any trace of enamel or of the milk-teeth been observed. The marked diphyodontism of the modern *Tatu* makes this fact somewhat surprising. Premaxillary teeth and the corresponding mandibular teeth occur in two genera, *Proeutatus* and *Peltephilus*, and in the latter they are so closely approximated that the teeth of both upper and lower jaws form a continuous series. *Prozaëdius* and *Stenotatus* have teeth like those of most recent armadillos, while in *Proeutatus* the teeth show an incipient division into lobes and have a complex masticating surface, produced by layers of dentine of different hardness and color, and with some resemblance to the teeth of the glyptodonts. In *Peltephilus* the teeth are sharply pointed and form what appears to have been a formidable lacerating apparatus, while, finally, in *Stegotherium*

the dentition is in such an extreme state of reduction that the animal must have been functionally all but edentulous.

In all the known genera, except *Peltephilus*, the skull has a very elongate and usually a slender rostrum, and, with the same exception, the zygomatic arch has a prominent descending, suborbital process, which is generally from the jugal, but sometimes from the zygomatic process of the maxillary also.

The cervical vertebræ closely resemble those of the modern armadillos, one or two vertebræ coalescing with the axis. The trunk is short, and in those genera in which the number is known does not contain more than eleven thoracic and four lumbar vertebræ; in the lumbar and the posterior part of the thoracic regions the vertebræ have the same complex mode of articulation, by means of accessory zygapophyses, as is found in recent genera. The sacrum is long and always has an extensive union with the ischia. The tail varies considerably in the different genera; it is usually quite elongated, but in some of the genera, as *Proeutatus*, it is of only moderate length, though very heavy; in *Stegotherium* the caudal vertebræ are remarkable for the great development of their transverse process. The ribs, both costal and sternal, and the sternum, differ in no important respect from those of the recent armadillos.

The shoulder-girdle is practically the same as in the existing genera, but the humerus is noteworthy for the great size and prominence of the deltoid ridge, and the epicondylar foramen is always present. The ulna has a very large olecranon, which in most of the species terminates proximally in a prominent, incurved hook. The manus is always pentadactyl and all the digits bear claws; in all known species

the second digit is the longest of the series. In only one genus, *Stenotatus*, are any of the phalanges coossified. The ungual phalanges are always long, heavy, decurved and pointed, and were evidently well adapted to burrowing habits.

The pelvis varies considerably in the different genera, but does not depart widely from the modern type. The femur is elongate and has a very prominent great trochanter, which in *Proeutatus* reaches remarkable proportions; the third trochanter is also well developed in all cases. As in the recent armadillos, the tibia and fibula are invariably coossified at both the proximal and the distal ends. Like the manus, the pes is always pentadactyl, though in some of the genera, and especially in *Peltephilus*, the lateral digits are much reduced. The ungual phalanges are usually much shorter and broader than those of the manus, and are often more like hoofs than claws.

In size, there is much variety among the Santa Cruz armadillos, ranging from the minute *Prozaëdius* to *Proeutatus*, some species of which are larger than any existing armadillo, except *Priodontes*, while the very incompletely known *Peltephilus grandis* may have equaled or even surpassed the latter.

To sum up: The Santa Cruz armadillos differ comparatively little in appearance or in structure from the modern ones, and yet it is apparent that they do not, as a whole, represent the main line of descent which ended in the recent genera. That evolution must have taken place in some other region of the South American continent, doubtless the same region as that which gave rise to the true sloths and the anteaters.

W. B. SCOTT.

PRINCETON UNIVERSITY.

#### SCIENTIFIC BOOKS.

*The Constructive Development of Group-theory; with a Bibliography.* By B. S. EASTON. Boston, Ginn & Co. 1902. Pp. iv + 89. Cloth, \$0.75. (Publications of the University of Pennsylvania, series of mathematics, No. 2.)

This monograph aims to present in continuous form, but omitting all proofs, the main concepts and results of abstract and substitution group theory. While the theory of linear groups is expressly excluded, some of its results are tabulated on pages 83 and 84 under 'systems of simple groups.'

Employing a set of abbreviations for the journals, the author has succeeded, in the short space of thirty-four pages, in giving an exhaustive bibliography of the subject. In it appear 157 names of authors. To further indicate its extent, we note that it gives 97 titles by G. A. Miller, 35 by L. E. Dickson, 33 by C. Jordan, 23 by W. Burnside, 21 by Cayley, 20 by Cauchy and 16 by Kronecker.

The treatise proper extends over 39 pages, the successive headings being as follows: substitutions, groups, substitution groups, conjugacy, multiple isomorphism and quotient-groups, composition series, commutators, Abelian groups, groups of order a power of a prime, Sylow's theorem and its extensions, Hamiltonian groups, transitivity, intransitivity, primitivity, regular groups, imprimitivity, multiple transitivity, class of a group and degree of transitivity, automorphism, representation, index notation.

The tables give the numbers of distinct abstract groups of each order as far as 63; the number of substitution groups of each degree as far as 18, classified as multiply transitive, other primitive, imprimitive, and intransitive; the types of group of orders  $p^2$ ,  $pq$ ,  $p^3$ ,  $pq^2$ ,  $pqr$ ,  $8p(p > 2)$ , 16,  $p^4(p > 2)$ ,  $p^5q$ , 32,  $p^6(p > 2)$ ; simple groups of low orders; orders of composite and soluble groups; systems of simple groups.

Some minor remarks or corrections are here in order. In § 21, for 'class' read 'degree.' In § 44, for 'product of two elements' read 'product of any two elements.' In § 26, add alternative designation 'commutative'

group' and remark that 'abelian group' is used in an entirely different sense in linear group theory. In § 38, on abstract groups, it is stated that 'these generating elements define the group completely,' whereas the generating elements with a complete set of generational relations are necessary for the definition of the group; also as alternative for 'equations' should be given 'generational relations.' In § 63 add 'itself and.' In § 73, 3 the correspondence should be defined. For  $(m - 1)$  read  $(m, 1)$ . In § 74, for  $(m - n)$  read  $(m, n)$ . In § 85, the identity group is not, as usual, included in the composition series. In § 239 is quoted incorrectly the reviewer's generalization of Hermite's theorem on the analytic representation of a substitution of degree  $p^n$ . The two congruences modulo  $p^n$  should be equations in the Galois field of order  $p^n$ . Since the variable  $z$  is indeterminate in the field, the only reduction consists in applying the algebraic equation  $z^{p^n} = z$  and reducing the coefficients modulo  $p$ . In formula 9 of page 84,  $p^{3n} - 1$  should read  $p^{2n} - 1$ .

For so elaborate a piece of work, executed with such thoroughness and success, both the specialist and the beginner in group theory must feel most grateful. In pointing out various errors in the literature, a valuable service has been rendered to the student.

L. E. DICKSON.

*Pathologische Pflanzenanatomie.* E. KÜSTER.  
Gustav Fischer, Jena. 1903. 8vo. Pp. iv + 312; 121 figs.

Dr. Küster's investigations upon gall-formations and structures of similar character in the plant has led him to a discussion of the entire subject of pathological anatomy of plants. The text-book resulting from this treatment of the subject takes into consideration the major structures that might be considered as histological or organographical departures from the normal, but does not include degenerations, or the phenomena of decay due to fungi or other causes.

The various abnormalities are classified according to the cytological and topographical features presented by their development, and are embraced under the following general

heads: Restitution, Hypoplasie, Metaplasie, Hypertrophie and Hyperplasie. *Restitution* is the term applied to all processes set in activity by the loss of a tissue or an organ, and may include the replacement of the lost members by the development of new ones on adjacent parts of the body, or on the injured surface; the substitution of an organ of a different character arising on the injured surface, or the substitution of an organ of a different character on adjacent portions of the plant. *Hypoplasie* includes all processes resulting from disturbances of any kind in which the number, size or differentiation of the cells does not attain the normal. *Metaplasie* is taken to include all development of the protoplasts by which their structure, composition, form or character of the membrane is different from the normal, and includes all progressive changes of the cell not connected with growth and division. *Hypertrophy* is used in its accepted sense to designate the production of abnormally large cells which may be aggregated in such manner as to result in abnormally large organs. Such enlargements may ensue in meristematic or permanent tissues. *Hyperplasie* is used to designate the abnormal increase in the volume of a tissue resulting from an unusual multiplication of the cells. Such increase in the number of cells may consist in the formation of a surplus number of the ordinary tissues, or by the formation of cells of a different character, such as in galls or calluses.

The two last-named divisions of the subject are of the greatest importance from the standpoint of the practical pathologist, and are given an adequate treatment in the present volume. These sections of the book owe much of their value to the original matter adduced by the author from his own investigation. The concluding section of the book consists in a general consideration of the etiology and morphology and pathological structures, and sets forth some of the more important problems of general pathology.

Dr. Küster's book is invaluable to the student of plant pathology, and has much more to commend it than any of the few reading books on the subject which have been written

in English, or been translated into that language. Its interest is scarcely less for the physiologist and for the botanist concerned with the problems of alterations and adaptations of structure. D. T. MACDOUGAL.

NEW YORK BOTANICAL GARDEN,  
BRONX PARK.

*Lehrbuch der vergleichenden Entwicklungs-geschichte der wirbellosen Thiere. Allgemeiner Theil. Erste und Zweite Auflage. Zweite Lieferung.* By E. KORSCHELT and K. HEIDER. Jena, Gustav Fisher. 1903.

The second instalment of the general part of Korschelt and Heider's 'Lehrbuch,' which has recently appeared, maintains the high standard of excellence which we have learned to expect from these authors. The instalment includes only the sixth chapter, that dealing with the maturation of the germ cells and with the phenomena of fertilization, but it runs to more than two hundred large octavo pages and contains over eighty figures. These numbers will give some idea of the comprehensiveness with which the subjects named have been treated, especially if it be remembered that not a little collateral material was considered in the first instalment of the work and is, therefore, omitted or merely referred to in the present part.

When all is of such general excellence it may seem invidious to make special mention of certain of the sections. In section IV., however, there is presented an admirable statement and discussion of the maturation divisions in their relation to the reduction question, and in its presentation certain new terms are introduced to indicate the three methods of maturation division recognized by Häcker. To the method, observed by Boveri in *Ascaris*, in which both the divisions of the chromosomes are longitudinal and in which, accordingly, there is no reduction division in the Weismannian sense, the term *eumitotic* is applied, since it is the method characteristic of ordinary somatic mitoses. For that method in which one of the chromosome divisions is transverse and the other longitudinal the term *pseudomitotic* is suggested, and this method is subdivided into a method of post-

reduction division in which the so-called reduction division succeeds the equation division and a method of *præreduction division* in which the reduction division is the first to occur. The possibility of a fourth method in which both divisions are reduction divisions is admitted, but it is held that at present its occurrence is not proved.

An excellent section is also that on the maturation of parthenogenetic ova, in which the question of the development of ova with a subnormal number of chromosomes is considered.

As in the preceding instalment of the work the statement of facts is throughout thorough, clear and well arranged, and opportunity is taken to discuss fairly their bearing on general questions, sections of great interest being devoted to the significance of the numerical reduction of the chromosomes in maturation, to sex determination, to the significance of fertilization, and as an appendix there is added an excellent review of the theories of heredity and the allied theories of differentiation.

The figures are throughout well chosen and reproduced and there is an extensive bibliographical list.

J. P. McM.

#### SCIENTIFIC JOURNALS AND ARTICLES.

THE *American Anthropologist* for January-March (Vol. V., No. 1), recently published, contains an exceptionally large number of articles, in addition to the usual book reviews, periodical literature and anthropologic miscellanea. 'The Native Languages of California' are treated, with seven plates, by Drs. Roland B. Dixon and A. L. Kroeber, the classification of these interesting linguistic groups dealing with structural resemblances rather than with definite genetic relationships—the aim being to establish not linguistic families, but types of families. The illustrated article, 'Sheet-Copper from the Mounds is not necessarily of European Origin,' by Mr. Clarence B. Moore, with a discussion by Mr. Joseph D. McGuire and others, is an able presentation of both sides of a long-disputed question in American archeology. Bearing on the same theme is an article by Warren K. Moorehead, 'Are the Hopewell Copper Ob-

jects Prehistoric?' followed by 'Primitive Metal Working,' by C. C. Willoughby. The entire question of aboriginal American copper-working is debated and many new evidences brought out by specialists who have devoted much time to the study of the problem of prehistoric metal-working and in experimental work with primitive appliances. In 'American Indian Games (1902)' Mr. Stewart Culin, the recognized authority on this subject, presents his most recent conclusions. Dr. George Grant MacCurdy reviews the 'Progress in Anthropology at Peabody Museum, Yale University,' during the last few years, describing the field work conducted and the more important collections made. Some 'Parsee Religious Ceremonial Objects in the National Museum' are described, with illustrations, by Dr. I. M. Casanowicz, introducing his paper with a brief account of the Parsees and their religious beliefs. Dr. Frank Russell, in an article on 'Pima Annals,' describes some interesting tally-sticks of the Pimas of Arizona on which are kept mnemonic or pictographic records of events, such as battles or skirmishes, infrequent natural phenomena, relations with white people, festivals, killings during drinking bouts, etc. The four 'annals' described cover the years 1833-4, 1836-7, 1857-8 and 1881-2. Mr. Clark Wissler, in a paper on 'The Growth of Boys,' gives in tabular form a series of correlations for the annual increments, based on some 1,500 annual measurements of about 300 individuals of a private school for boys. Dr. Maurice Fishberg treats of pigmentation among the Jews, continuing from the last number of the journal his discussion of the 'Physical Anthropology of the Jews.' Mr. S. C. Simms describes, with an outline figure, a curious 'Wheel-shaped Stone Monument in Wyoming,' the former use of which is problematical. Mr. George F. Kunz presents a biographic sketch, with an excellent portrait, of the late Heber R. Bishop, and describes the remarkable jade collection which Mr. Bishop presented to the Metropolitan Museum of Art. The proceedings of the meeting of Section H of the American Asso-

ciation for the Advancement of Science, with its affiliated societies, at the Washington meeting, is given by Dr. George Grant MacCurdy, and the number closes with an account of the organization of the American Anthropological Association, with its constitution and a list of the officers and members.

The *American Anthropologist* is now published under the auspices of the new association, of which it is the official organ, as well as that of the Anthropological Society of Washington and the American Ethnological Society of New York.

#### SOCIETIES AND ACADEMIES.

##### THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of April 20, 1903, Professor J. A. Holmes gave an illustrated account of some of the efforts that are being made in the United States to preserve the forests and other natural features of the country, showing what is being done for the preservation of some of the great scenic features and particularly what the national government is doing in the way of national parks and forest reserves and in the protection of the forests on such reservations.

One person was elected to active membership.

At the meeting of May 4, 1903, Mr. H. A. Wheeler gave an account, illustrated by several lantern slides and some of the recently ejected material, of the active Mexican volcano Colima, of which he saw some of the recent eruptions. It was shown that the material now being ejected is a trachyte, or belongs to the acid series of lavas, while the basal plain of the volcano is of basalt, which is basic, resting upon volcanic tufa. It was pointed out that this sequence reverses the Richtofen order of volcanic discharges, from which it was considered probable that there have been other centers of lava outflow besides the now visible vents of Mt. Colima (active) and Mt. Zapotlan (inactive). Samples of the ash from the eruption of February 28, in the form of granules 1 to 2 mm. in diameter, which fell at Tuxpan, some twenty-five miles from the crater, and which were secured by Pro-

fessor Trelease, contained 62.5 per cent. of silica, according to the analysis of Mr. W. M. Chauvenet.

An amendment to the by-laws was adopted, providing that the home recently presented to the academy shall not be mortgaged or voluntarily encumbered and shall not be sold except with the consent of two thirds of the members, obtained by letter ballot, and, if sold, the proceeds, or so much thereof as may be necessary, are to be used to provide another home for the academy.

At the meeting of May 18, 1903, Dr. C. Barck gave a detailed account of the Grand Cañon of the Colorado, with lantern illustrations. After an outline of the geology, past and present, of the plateau province and the cañon district, he gave a description of the latter and added a report of its first deliberate crossing. This was made by Mr. James and himself in 1901. They started from Bass's camp, about twenty-four miles west of the Bright Angel Hotel. Their point of destination, 'Point Sublime,' on the northern rim of the cañon, was reached, after some difficult traveling, on the fifth day; the return took three days.

One person was elected to active membership.

WILLIAM TRELEASE,  
*Recording Secretary.*

AMERICAN CHEMICAL SOCIETY. NORTHEASTERN  
SECTION.

THE forty-fifth regular meeting of the section was held on Friday, May 22, at 8 P.M., at the Technology Club, Boston, Vice-President Henry Howard in the chair. Thirty-five members were present.

Professor S. W. Stratton, of Washington, D. C., gave an address on 'The National Bureau of Standards,' in which he first gave a historical introduction describing the legal standards of length and weight used in this country from 1776 to 1901, when the National Bureau of Standards was established by act of Congress. The functions of this bureau are briefly the comparison of the standards used in scientific investigation, engineering, manufacturing, commerce and educational

institutions with the standards adopted or recognized by the government, the construction when necessary of standards, their multiples and subdivisions, the testing and calibration of standard measuring apparatus, the solution of problems which arise in connection with standards, the determination of physical constants and the properties of materials. The bureau is authorized to exercise its functions for the government of the United States, for state and municipal governments within the United States, for scientific societies, educational institutions, firms, corporations or individuals. Temporary quarters are now occupied by the bureau, and two permanent buildings in the outskirts of Washington are in process of erection, one of which, the mechanical laboratory, is now nearly completed, and will contain the mechanical and electrical plant, instrument shop and laboratories for experimental work or testing requiring considerable power or large currents. The second building is a physical laboratory and will be of extra heavy construction, and will contain laboratories for testing and investigation in connection with problems concerning length, mass and capacity. A large space is to be devoted to electrical measurements of all kinds, and the upper floors are to be used as chemical laboratories. The buildings are connected with a tunnel, part of which will be used as a laboratory for experiments requiring a long distance.

The lecturer described the present work of the bureau in verifying standards of length, mass and capacity, electrical resistance and capacity, electromotive force, photometry, temperature standards, calibration of chemical glassware, etc., and showed several lantern slides of plans of the buildings under construction.

ARTHUR M. COMEY,  
*Secretary.*

MEETING OF THE BERZELIUS SOCIETY.

THE eighty-fifth monthly meeting of the Berzelius Chemical Society was held in the Department of Agriculture Laboratory, Monday, May 4. The program was filled by Mr. J. W. White, student in dyeing at the A. &

M. College, and by Dr. B. W. Kilgore, state chemist.

Mr. White read a paper embodying a report of studies made of the sulphur class of dyes, which are to-day the most interesting class of colors with which the cotton dyer has to work. Samples were obtained from Mr. White from all the leading dye-stuff dealers. These samples were submitted to all the different tests corresponding to the tests through which the cotton must pass in actual use, and in all these tests the new class of sulphur colors showed themselves very much superior to the direct cotton colors now in use, and they promise to ultimately replace the dye-stuffs now on the market, and entirely change the method for dying cotton goods with direct dye-stuffs. The paper was illustrated with dyed samples which had been tested to all the different conditions.

Dr. Kilgore filled the program for a short time with a discussion of the recent work of the soil survey in this state. Though the work has not progressed far enough to draw very many conclusions, several very interesting things were noted. In analysis made of soil waters, for plant food, as was to be supposed, it was found that the more leachy sandy soils contained the largest amount of plant food in solution in the third and second foot in depth. It is interesting, however, to note that the same holds with the red clay soils in the Piedmont section of the state.

In the study of the composition of type soils of the state, which work is being carried on by the department, it has been found that lime is present in seemingly unusually small amounts. In the red-clay soils in the Piedmont section of the state, where there were considerable amounts of phosphoric acid, nitrates and potash, analysis revealed scarcely a trace of lime. This would indicate that the soils are in actual need of an application of lime, but of course for definite conclusion this would have to be tested experimentally.

J. S. CATES,  
Secretary.

RALEIGH, N. C.,  
May 5, 1903.

## DISCUSSION AND CORRESPONDENCE.

## MOUNT PELEE.

TO THE EDITOR OF SCIENCE: Should not the Martinique volcano be called either *Mont Pelé* or *La Montagne Pelée* or in plain English *Mount Pelee* (no accent)? My impression from a visit to St. Pierre and Morne Rouge in 1895 is that the common name was *La Montagne Pelée* and I understood that *pelée* was an adjective meaning *bare* like the Spanish *pelado*, also applied to bare or woodless hills. I remember that the mountain did not then seem to have any bare surface at all. Of course, if an adjective, the form to go with the masculine *mont* is *pelé* and with the feminine *montagne* is *pelée*, and the combination *Mont Pelée* is neither French nor English. I am reminded of this now by what seems a complete confirmation in Professor Heilprin's book at page 166, although he calls his work 'Mont Pelée and the Tragedy of Martinique.' Geo. Kennan's 'Tragedy of Pelée' is non-committal and his use of the name always accurate.

In Stark's 'Guide to Barbados and the Caribbee Islands,' Boston, 1893, the form *Mt. Pelee* (no accent) occurs at p. 42. This I suppose should be read *Mount Pelee* on usual English analogies. The writing of a French accent, however, seems to involve the correct French form of the word.

MARK S. W. JEFFERSON.

## THE PROPOSED BIOLOGICAL LABORATORY AT THE TORTUGAS.

TO THE EDITOR OF SCIENCE: Professor Mayer, of the Brooklyn Museum, has asked me to give my opinion on the advisability of establishing a tropical biological station in American waters.

I think that such a station would be an invaluable aid to biological research in all departments, and no one who is acquainted with the rich fauna of the Mediterranean and even of British seas can help regretting the way in which work is hampered by the comparative paucity of life on our northeastern coasts.

West Indian waters would, however, surpass in interest and variety of species the Mediterranean.

It seems to me that a station on one of the Bahama Islands, if possible in a place where some sheltered or lagoon water could be had, would be the situation most to be desired.

E. W. MACBRIDE.

MCGILL UNIVERSITY.

#### SHORTER ARTICLES.

##### THE FIRST EDITION OF HOLBROOK'S NORTH AMERICAN HERPETOLOGY.

IN a 'biographical memoir of John Edwards Holbrook,' prepared for the National Academy of Sciences, and in the compilation of which I took unusual care, I assumed that only three volumes of the first edition of the 'North American Herpetology' had been published. In the 'publisher's note' to the second edition it was, indeed, explicitly stated that 'in consequence of \* \* \* the demand for the *first three volumes* it became necessary either to reprint them or to make a new edition,' and thus by implication it was certified that no later volume of the first edition had been published. With this statement all the many bibliographies and works I had consulted agreed.

I was not a little surprised, therefore, when I received a letter from my friend, Mr. Witmer Stone, informing me that 'the last word' has not been said on the 'Herpetology,' and that there was a fourth volume of the first edition in the library of the Academy of Natural Sciences of Philadelphia. I was led thereby to review numerous bibliographies and works on reptiles and amphibians to ascertain whether any references had been made to a fourth volume which I had previously overlooked. Duméril and Bibron, Baird and Girard, Cope, Garman, Günther, Boulenger, and Stejneger alike made no reference to such a volume. The bibliographies of Agassiz and Strickland, Engelmann, Carus and Engelmann, and catalogues of numerous public libraries were also silent as to the existence of any other than 'the first three volumes.' The British Museum librarians, indeed, knew only one volume; in its great catalogue, 'Vol. I., Philadelphia, 1836. 4°' is listed, and the remark made 'No more published!'

In short, no recent author seems to have known a fourth volume of the first edition, but it occurred to me that Dekay, who was a friend of Holbrook and published his part on the reptiles in the same year (1842) as Holbrook did his second edition, might have done so. On reference to his work, I found he did.

Dekay, in his 'Zoology of New York,' Part III., listed Holbrook's work in his 'List of works referred to' by him (p. vi), as 'North American Herpetology; [etc.] 4 vols. 4to. Philadelphia, 1834 et seq.,' but inasmuch as he referred, in the synonymies of his work, to the second edition, although published in the same year (1842),\* this was entirely insufficient. Occasionally, however, he did refer to a volume IV. ('vol. 4') which evidently was not that of the second edition.

Under 'the Snapping Turtle' (p. 8), reference was made to 'vol. 4, p. 21, pl. 3; and vol. 1, p. 139, pl. 23 of the 2d Ed.'

Under 'the Geographic Tortoise,' reference was made to 'Testudo id. [i. e., *geographica*] HOLBROOK, N. Am. Herp. Vol. 4, and Vol. 1, p. 99, pl. 14 of Ed. 2da.' This was quite erroneous; Holbrook described his '*Emys pseudogeographica*' in the fourth volume, but not *Emys geographica*, that species having been described in the first volume under the new specific name *Emys megacephala*. Under 'the Pseudographic Tortoise,' as well as all the other Chelonians, reference was only made to the second edition.

Under '*C[oluber] sayi*' (noticed as extra-limital at p. 41) reference was made to 'Vol. 4,' which must have been of the first edition, since in the second edition the species was described in the third volume.

Under 'the Ribbon Snake' (p. 47) reference was made to 'Holbrook, N. A. Herpetology, Vol. 4, p. 21, pl. 4; and Vol. 4, p. 21, pl. 4, of 2d Ed.' Evidently the author had taken up the fourth volume of the second edition twice, for in that of the first, the '*Coluber saurita*' was described on page 87 and figured on plate 16.

The '*C. obsoletus*, '*C. rhombomaculatus*'

\* Dekay probably had proof-sheets and not complete volumes.

and '*C. doliatus*' were bracketed ({} ) and listed as unpublished '(HOLBROOK, ined.).' Really each of these species was published in 'Vol. III.' of the second edition and Dekay had referred to Holbrook's descriptions of the species which occur on adjoining pages, i. e., *Coluber constrictor* (III., 55, pl. 13, erroneously given by Dekay as 'p. 69, pl. 15') and *Coronella sayi*. The *C. rhombomaculatus* and *C. doliatus* of the first edition were referred to *Coronella* in the second edition.

Under *Salamandra rubra*, reference was made to 'Holbrook, N. Am. Herpetology, Vol. 4,' without specification of page or plate. In the second edition the species was treated of in the fifth volume.

For all the other species described in the fourth volume, reference was made by Dekay to the second edition only.

With these exceptions, I know of no references to the volume in question.

The subjoined description and summary of the contents of the volume are entirely due to Mr. Stone.

Vol. IV., Philadelphia, J. Dobson, 1840. [4to, title page + blank leaf + introduction [vii]-viii + contents (one leaf) + 9-126 pp., 28 pl.]

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\* Misquoted in text VIII. for XVIII.

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<i>Crotalus oreganus</i> (n.).....	115	29* [=24]
<i>Salamandra cirrigera</i> .....	119	30 [=25]
<i>quadramaculata</i> (n.)†...	121	27 [=26]
<i>rubra</i> .....	123	27
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"Acknowledgements in the introduction are to Dr. Harden, of Georgia; S. S. Haldeman, Dr. Barratt, of South Carolina, for specimens, Mr. Heimans, Miss Martin and Chas Rogers for drawings, and to Dr. Logan for aid.

"The lithographing is by Duval, the drawings by Dr. T. M. Logan (4), A. Heiman (2), J. Queen (4), C. Rogers (3), Stocking (1), J. Sera (5), J. H. Richard (6), Miss Martin (1), Dr. J. L. Smith (1), A. Newsam (1).

"The volume is perfectly uniform with the others."

It will be noticed that Mr. Stone records no less than ten artists as contributors to the plates of the volume. It is quite possible that Holbrook may have become dissatisfied with the results, and for that reason suppressed the volume. His ideals were high, but, unfortunately, his constitutional inertness and forgetfulness interposed to prevent him from realizing his ideals; those ideals, too, were rather the perfection of the artistic than of the literary parts of his work. His later artist, Richard (pronounced Ree-shard), was an Alsatian Frenchman and his work required rigorous supervision. As a matter of gossip, he informed me that he had heard, in Charleston, that Holbrook had spent 'three fortunes' in the preparation and publication of his works. He would become dissatisfied with a work before its completion and would have new plates drawn and published. Then he would offer to substitute the new for the old

\* The numbers on the last five plates are badly jumbled; the numbers in the text are all right, however.

† Name accompanying description is 'maculo-quadrata.' The plate name comes first but *maculo-quadrata* is in the contents at the beginning of the book!

numbers, and, I was told, might even decline to let an old subscriber have a copy of the new edition unless the old one was returned—to be destroyed. If this statement was correct, the rarity of the old volumes would be to some extent at least accounted for.

The discovery of the new volume is interesting chiefly from a historical or bibliographical point of view. The only essential change it will entail is the dating back of the first descriptions of seven species, viz., *Crotalus oreganus* (so spelled), *Coluber couperi*, *Coluber quadrivittatus*, *Coluber rhombomaculata*, *Bufo quercicus*, *Salamandra quadrimaculata* and *Salamandra haldemani*.

In my biographical memoir I did not consider it necessary to correct or notice numerous misstatements respecting Holbrook's works, but perhaps it may be advisable to refer to one here.

In Engelmann's 'Bibliotheca Historico-naturalis' (p. 172) and in Carus and Engelmann's 'Bibliotheca Zoologica' (p. 134) to 'Holbrook, John Edw.' is accredited a publication entitled 'Scientific Tracts. 3 Vols. in 12. Boston 1831-33 (London, Wiley and Putnam.) 18s.\*'

John Edwards Holbrook had nothing to do with that serial, the series having been commenced by one Josiah Holbrook in company with other writers. I have been able to see the volumes, which are in the library of congress. The three volumes are composed each of 24 tracts of a monographic nature, the 'terms' being '24 numbers a year, at one dollar and fifty cents, payable in advance.' Volume 1 has such contents as 'The Atmosphere' (numbers 1 and 3), 'Geology' (2), 'Gravitation' (4), 'Animal Mechanism' (5) and the like; one of the coauthors was J. V. C. Smith.

This series was succeeded by a 'new series,' 'conducted by Jerome V. C. Smith, M.D.' issued in numbers of 32 pages each on the 1st and 15th of each month, miscellaneous in their character, and paged to form two volumes each year. Smith gave up and in 1836 a new

\* The words are quoted from Engelmann (p. 172) and differ slightly from those in Carus and Engelmann.

volume (apparently the last) of the 'Scientific Tracts' was published by others in 12 semi-monthly numbers of 32 or 24 pages, and, at last, of 16 pages each. Those were the years of tracts, religious, temperance, political, and even 'scientific.'

My thanks for information respecting the volume in question are due and given to Mr. William J. Fox, as well as to Mr. Witmer Stone.

THEO. GILL.

COSMOS CLUB,  
April 28.

#### RECENT ZOOPALEONTOLOGY.

##### CONCERNING THE ANCESTRY OF THE DOGS.

MR. J. B. HATCHER, in a recent memoir on Oligocene Canidæ, distinguishes three closely allied genera from the White River formation and proposes some very interesting changes in the phylogeny of the family. His observations are based on the very fine specimens of these rare fossils collected by Mr. O. A. Peterson for the Carnegie Museum. These include one complete and three incomplete skeletons, the skulls all well preserved. The thorough and clear description of the skeleton of *Daphænus felinus* is especially valuable as based on a single and very complete specimen. The resemblance of this primitive dog to the contemporary ancestors of sabre-tooth cats has been strongly urged by Professor Scott in his previous description of *Daphænus*; Mr. Hatcher, on the contrary, is impressed less by its feline than by its creodont characters, which he points out at some length.

He distinguishes three closely allied genera among these specimens:

1. *Daphænus*, with elongate skull, high sagittal crests, robust premolars, etc.

2. *Protemnocyon*, gen. nov., with short skull, low sagittal crest and small premolars.

3. *Proamphicyon*, gen. nov., with elongate skull, high sagittal crest, small premolars and serrate canines.

(The distinctions between the first two genera are better displayed in the referred species, *D. felinus* Scott and *P. inflatus* Hatcher, than in the typical species *D. vetus* Leidy and *P. hartshornianus* Cope, which, as

shown by skulls in the American Museum, are intermediate forms and quite closely allied. The height of sagittal crest, assigned as one of the distinctive generic features of *Daphænus*, is a highly variable character in most carnivora, dependent on sex, age and individual robustness. A series of opossum skulls will well illustrate analogous variations, as recently described by Allen. Serrations are to be found on the unworn canines of all daphænoid dogs that I have examined, but disappear very quickly with wear. Canines of old animals are smooth and more rounded in section from wear.)

As the names indicate, Mr. Hatcher believes that *Protemnocyon* is ancestral to *Temnocyon* of the John Day formation, and *Proamphicyon* to *Amphicyon* of the Loup Fork, while *Daphænus* left no descendant. Scott, Eyerman, and Wortman and Matthew had, on the contrary, derived *Temnocyon* from *Daphænus*, and all previous authors have regarded *Amphicyon* as a distinctively European type which found its way to America only in the later Miocene.

Mr. Hatcher does not recognize *Mesocyon* Scott (= *Hypotemnodon* Eyerman, type *Temnocyon coryphaeus* Cope) as a valid genus, and bases his comparison of *Protemnocyon* with *Temnocyon* upon *T. coryphaeus*, and not upon the typical species (*T. altigenis* and *T. ferox*). The authors above mentioned had derived the typical *Temnocyons* from *Daphænus* but threw out *Mesocyon coryphaeus* from this line of descent.

(Mr. Hatcher can hardly have seen Dr. Eyerman's paper of May, 1896, for he could not fail to observe that the characters assigned to separate *Temnocyon* and *Mesocyon* are identical with those by which he separates *Daphænus* and *Protemnocyon*, only they are even more marked and certain differences in the teeth are superadded. In the White River there are intermediate species between the two extremes; in the John Day these have not been found. If then *Protemnocyon* is a good genus, *Mesocyon* must certainly be held. If we can assume that the John Day formation is of later age than the White River, it

appears probable that *Mesocyon* and *Temnocyon* represent the further progress of the differentiation between the large-skulled robust *Daphænus* and the small-skulled, more slender *Protemnocyon*. The extremes have become more divergent and the intermediate forms weeded out. The *Daphænus-Temnocyon* line appears to lead into a type such as *Cyon*, or the dholes, and evidences of an intermediate stage from the Loup Fork Miocene were described by Matthew about a year ago. The *Protemnocyon-Mesocyon* line leads into much more typical dogs, but can not be considered as a direct ancestor of any living species which I have examined.

Mr. Hatcher's derivation of *Amphicyon americanus* from *Proamphicyon* is, I think, hardly admissible. *Amphicyon* first occurs in America in the upper Miocene Loup Fork, but in Europe it is found in the oldest Oligocene formations, as old as or older than the White River. The evidence is not at all such as to warrant our affirming the actual convergence of the Miocene Amphicyons of Europe and America, the one derived from one Oligocene stock, the other from a widely different one. We might, perhaps, believe that *Proamphicyon* and the European Oligocene Amphicyons had a common Eocene ancestor; but as *Proamphicyon* is in fact very much nearer to *Daphænus* than to *Amphicyon* it seems more reasonable to suppose that the latter is, as Wortman believes, derived from a distinct group of short-jawed dogs of the Middle Eocene.)

Mr. Hatcher makes at the close of his memoir some good-natured criticisms of the views expressed by Wortman and Matthew in 1899 as to the ancestry of certain Canidæ. That such phylogenies are to a high degree hypothetical, and seldom, if ever, more than approximations to the truth, I am most ready to admit—and have always regarded such a saving clause as implied in any phylogenetic remarks. But the new evidence brought forward since then by Wortman and myself, and now by Mr. Hatcher, serves to confirm in most points the very lines of descent which we suggested at that time.

W. D. MATTHEW.

*IRON AND STEEL TRADE IN 1902.*

THE report, now in press, on the iron and steel trade for 1902, by Mr. James M. Swank, United States Geological Survey, shows a continued advance in the annual domestic production of pig iron, the excess over 1901 being 1,942,953 tons, or almost 12.24 per cent. The total production in 1902 was 17,821,307 long tons, as compared with 15,878,354 tons in 1901, 13,789,242 tons in 1900, 13,620,703 tons in 1899, 11,773,934 tons in 1898, and 9,625,680 tons in 1897.

Notwithstanding this increase of production, the imports of iron and steel in various forms amounted in foreign value in 1902 to \$41,468,828, as against \$20,395,015 in 1901, an increase in 1902 of \$21,073,811, or over 100 per cent. The total exports of iron and steel, including locomotives, car wheels, machinery, etc., amounted in 1902 to \$97,892,036, as against \$102,534,575 in 1901, \$129,633,480 in 1900, \$105,690,047 in 1899. The exports of agricultural implements, which are not included above, amounted in 1902 to \$17,981,497, against \$16,714,308 in 1901.

The consumption of pig iron in 1902 was approximately 18,439,899 long tons, of which 625,383 tons were imported, as compared with 16,232,446 tons in 1901, of which 62,930 tons were imported. The increased production of pig iron in 1902 over 1901 was 1,942,953 tons; the increased consumption was 2,207,453 tons.

At the close of 1902 the number of furnaces in blast was 307, as compared with 266 at the close of 1901 and 232 at the close of 1900. At the close of 1902 105 furnaces were out of blast—many being temporarily banked from lack of fuel—as against 140 furnaces at the close of 1901.

The production of Bessemer steel ingots and castings increased more than half a million tons in 1902—to 9,306,471 long tons; the production of Bessemer steel rails remained almost stationary. The production of open-hearth steel ingots and castings in 1902 was 5,687,729 long tons, an increase of 1,031,420 tons over 1901.

In the fiscal year 1902 there were built for mercantile service 106 steel vessels and one

iron vessel, with a gross tonnage of 280,362 tons, as compared with 119 steel vessels and one iron vessel, with a gross tonnage of 196,851 tons, built in 1901. Of these 107 vessels, 49, with a gross tonnage of 161,930 tons, were built at ports on the Great Lakes.

The production of pig iron in Canada in 1902 increased to 319,557 long tons, over 30 per cent. as compared with 1901; and the production of steel ingots and castings in 1902 was 182,037 long tons, as compared with 26,084 tons in 1901, an increase of 155,953 tons, or nearly 600 per cent.

The second part of Mr. Swank's report consists of an interesting and valuable series of tables presenting complete statistics of the production of iron and steel, iron ore, and coal in the United States, Great Britain, Germany, France and Belgium, to the close of 1901, thus showing the progress that has been made by these countries in the first year of the twentieth century.

*'FESTSCHRIFT' IN HONOR OF PROFESSOR VAUGHAN.*

A COMMITTEE consisting of John J. Abel, Johns Hopkins University, Baltimore, Md.; Edmund Andrews, Chicago, Ill.; Flemming Carrow, University of Michigan, Ann Arbor, Mich.; Richard Dewey, Wauwatosa, Wisconsin; George Dock, University of Michigan, Ann Arbor, Mich.; William J. Herdman, University of Michigan, Ann Arbor, Mich.; William H. Howell, Johns Hopkins University, Baltimore, Md.; Franklin P. Mall, Johns Hopkins University, Baltimore, Md.; William J. Mayo, Rochester, Minnesota; Lewis S. Pilcher, Brooklyn, New York; Albert B. Prescott, University of Michigan, Ann Arbor, Mich.; Henry Sewall, Denver, Colorado; and G. Carl Huber, secretary, has sent out the following announcement:

The close of the present academic year marks the twenty-fifth anniversary of the doctorate of Doctor Victor C. Vaughan. Certain of the former students of the Department of Medicine and Surgery of the University of Michigan and his colleagues have deemed it opportune to commemorate the long and valuable services which he has rendered to his Alma Mater and to American medi-

cine in general. This expression of appreciation and esteem should be one of permanent value and to the educator and investigator nothing can be more acceptable than the dedication of a volume which contains the researches of friends and co-workers. Such a volume, or *Festschrift*, is an appropriate honor to the recipient and is itself a valuable contribution to medical science. The suggestion that on this occasion the testimonial should take this form met with the cordial favor and ready approval of the committee. At an early date steps were taken to secure adequate and representative contributions and it will be a source of pleasure and pride to all friends of the movement to know that the project is nearing its realization. The commemorative volume, which will be of about seven hundred pages, is now in press and is expected to be ready for distribution by the end of June.

The price to subscribers, in advance, has been fixed at five dollars for cloth binding, six dollars for half morocco. After publication the price of the volume will be raised.

Subscriptions may be sent to Dr. F. G. Novy or to Mr. George Wahr, publisher, Ann Arbor, Mich.

#### SCIENTIFIC NOTES AND NEWS.

PROFESSOR J. PETER LESLEY, the eminent geologist, died at Milton, Mass., on June 1, aged eighty-three years.

VICTORIA UNIVERSITY, as part of the celebration at Manchester in commemoration of Dalton's publication of the atomic theory, has conferred the degree of D.Sc. on Professor F. W. Clarke, of Washington, and Professor J. H. Van't Hoff, of Berlin.

THE University of Wales will confer the degree of Doctor of Science on Lord Kelvin 'on the ground of his eminent services to physical science,' and upon Lord Lister, 'on the ground of his long-continued scientific research, which, by establishing a system of antisepsis, has revolutionized the practice of surgery throughout the world.' The degrees will be conferred at a congregation of the university next November at Cardiff.

DR. H. M. REESE, of the Lick Observatory, has accepted an appointment in the Yerkes Observatory. His place at Lick Observatory will be filled by Mr. J. H. Moore, assistant

in the department of physics of Johns Hopkins University.

THE German Chemical Society has conferred its gold Hofmann medals on Professor Henri Moissan and Sir William Ramsay.

MR. BION J. ARNOLD has been elected president and Messrs. Calvin W. Rice, W. S. Barstow and Ralph D. Mershon, vice-presidents of the American Institute of Electrical Engineers.

MR. HENRY L. WARD has been elected custodian of the Milwaukee Public Museum for a period of five years.

DR. W. J. HOLLAND, the director of the Carnegie Museum, Pittsburgh, gave the commencement address before the University of North Carolina at Chapel Hill on June 3.

PROFESSOR HUGO MÜNSTERBERG, of Harvard University, sailed on May 30 for Germany, where he will represent the St. Louis Exposition in an effort to secure the cooperation of the German government and educational institutions in the International Congress of Arts and Sciences to be held in connection with the exposition next year. Professor Albion W. Small, of the University of Chicago, will undertake a similar mission to France. Professor Simon Newcomb, chairman of the committee, is also abroad, partly in the interests of the congress.

PROFESSOR W. F. WILLCOX, of Cornell University, has been requested by the director of the census to prepare a report on the census work of other countries, and will spend the present summer in Europe.

PROFESSOR C. S. SARGENT, director of the Arnold Arboretum, accompanied by his son, Mr. A. R. Sargent, and Dr. John Muir sailed for Europe on May 29. After traveling through France, Holland and Germany the botanists will go to St. Petersburg and Moscow, and thence over the Transsiberian Railway to Pekin. They will make numerous stops on the way to collect seed and herbarium specimens in Siberia and northern China. From Pekin they will go to Java and Hong Kong.

DR. BARTON WARREN EVERMANN, for several years ichthyologist of the U. S. Fish Commission, and assistant in charge, Division of Fisheries, since November, 1902, has been promoted to the position of assistant in charge, Division of Scientific Inquiry of the U. S. Fish Commission. On June 13 he sails on the *Albatross* from Seattle for Alaska, where, as assistant head of the special Alaska Salmon Commission, he will spend the summer making an investigation of the salmon fisheries of that coast.

THE Earl of Onslow has been appointed president of the Board of Agriculture for Great Britain.

THE subject of the Romanes lecture, which is to be delivered by Sir Oliver Lodge, F.R.S., at Oxford, on June 12, will be 'Modern Views on Matter.'

PROFESSOR GEORGE E. BEYER, of the department of biology and natural history at Tulane University, has gone to Vera Cruz, Mexico, to continue his studies on yellow fever.

MR. J. A. SHAFER, custodian of the botanical collections at the Carnegie Museum, who went to Cuba with Dr. N. L. Britton some months ago, has returned. He remained on the island after Dr. Britton's departure for the north in order to prosecute further researches. As the result of the joint labors of Dr. Britton and Mr. Shafer the herbaria at Bronx Park and Pittsburgh have each received over one thousand species of the plants of Cuba in fresh condition.

THE Berlin Geographical Society celebrated on May 4 its seventy-fifth anniversary. In honor of the seventieth birthday of Professor von Richthofen the sum of 26,000 Marks has been subscribed as a fund for research. The society has awarded its Nachtigall medal to Dr. Gerhard Scholt, of Hamburg.

LIEUT. C. J. SHACKELTON, who was one of the officers of the British Antarctic Expedition, is at present in the United States on his way from New Zealand to England.

SYRACUSE UNIVERSITY has appointed Professor H. Monmouth Smith delegate to the

Congress of Applied Chemistry at Berlin and granted him leave of absence till fall. Dr. H. C. Cooper of the same university has also been granted leave of absence that he may work for a year as research associate in physical chemistry at the Massachusetts Institute of Technology. Mr. Charles S. Bryan, Jr., Ph.B., Syracuse, has been appointed research assistant to Professor A. A. Noyes of the Massachusetts Institute of Technology.

M. A. LEBEUF, lecturer in astronomy in the University of Montpellier, has been appointed director of the Observatory at Besançon.

IT is stated in *Nature* that steps have been taken to secure and erect a memorial of the late Sir George Stokes in Westminster Abbey. At a meeting of a joint committee of the University of Cambridge and the Royal Society, held on March 12, the Duke of Devonshire being in the chair, it was resolved that the authority of the Dean and Chapter of Westminster be requested to place a medallion relief portrait of Sir George Stokes in the Abbey of the same general character as the memorials of Darwin and other scientific men already there. A letter has since been received from the Dean of Westminster expressing his general assent to the proposal and his willingness to take detailed plans into consideration. Mr. Hamo Thornycroft, R.A., has undertaken to prepare a medallion, the material to be bronze, and the head to be in high relief. It is estimated that the cost of placing this memorial in Westminster Abbey will be about £400. The treasurers of the fund are the vice-chancellor of the University of Cambridge and the treasurer of the Royal Society, to whom subscriptions may be sent.

DR. THOMAS JAY HUDSON, for some years principal examiner in the U. S. Patent Office and the author of a number of books of a psychological character, has died at Detroit.

MR. HENRY J. WOODMAN, a natural history collector, has died at Mount Vernon, N. Y.

THE death is announced of Dr. Max Westermayer, professor of botany at Freiburg, Switzerland, and of Dr. H. Schurtz, assistant in ethnography in the museum at Breman.

MR. WILLIAM TALBOT AVILINE, for many years engaged on the Geological Survey of Great Britain, died on May 12, at the age of eighty-one years.

A TELEGRAM has been received at the Harvard College Observatory from Professor Percival Lowell, at Flagstaff, Arizona, stating that a large projection on Mars was found by Slipper, May 26, at 15<sup>h</sup> 35<sup>m</sup> Greenwich mean time. The position angle was 200° and the projection lasted thirty-five minutes.

THE expedition organized for a scientific survey of the Bahama Islands by the Geographical Society of Baltimore, to which we have already referred, left Baltimore on June 1. It is under the direction of Dr. G. B. Shattuck and includes more than twenty members.

As the result of an expedition to Florida during the spring the Carnegie Museum has added to its ornithological collections over 1,300 specimens in fine condition.

THE anniversary dinner of the Royal Geographical Society was held on May 18. The president, Sir Clements Markham, proposed the toast of 'The Medallists,' to which Mr. Douglas Freshfield and Dr. Sven Hedin responded. The president next proposed 'Success to the Antarctic Expedition.' Major L. Darwin proposed 'The Guests,' and Sir W. Huggins and Mr. Pember Reeves responded. The president then gave 'The Staff,' and the secretary (Dr. J. S. Keltie) replied. Mr. E. Gosse proposed the last toast, 'The President and the Society,' to which the president replied.

ACCORDING to a cablegram to the daily papers Premier Balfour announced in the House of Commons on May 26 that the government was prepared to contribute to the relief of the officers and men of the Antarctic steamer *Discovery*, now icebound in the Antarctic region. At the same time, the Premier criticized the action of the Royal Geographical Society and the Royal Society in sending out the expedition without being fully prepared to safeguard it, and said that even the limited aid the government was accustomed

to give to scientific research was only justified so long as the government felt absolute confidence that the scientific bodies inviting help had given all the information regarding the cost and limits of the proposed action. That confidence had been rudely shaken in the present case.

A STOCKHOLM correspondent writes to the *London Times* on May 19: Serious uneasiness has arisen here about the fate of Dr. Norden-skiöld's expedition on board the *Antarctic*. Contrary to expectation, the ship has not yet returned to South America. She had not a very large stock of provisions on board, and it is feared that a second winter out might prove disastrous, as the ship's company consists of 27 men all told, one Argentine officer being among them. A plan for a relief expedition under the command of Lieutenant Gyldén of the Swedish Navy, who has previously conducted an expedition to Spitzbergen, has just been formed; 50,000 crowns have been collected by private subscription, and the Riksdag to-day granted 200,000 crowns for the expedition, which is to start towards the end of August next. The Argentine Government has offered its cooperation.

FOREIGN journals announce that a Norwegian expedition, commanded by Captain Roald Amundsen, has left Christiania with the object of fixing the exact situation of the magnetic North Pole. The party are expected to be absent for four years, the route taken being by Lancaster Sound, Boothia Felix, where a magnetic observatory will be established for a period of two years under control of two members of the scientific staff, and back by the North-West Passage, Victoria Land and the Behring Straits.

THE executors of the late Mr. Reyner Hurll have made a donation of £500 to the funds of the Brown Animal Sanatory Institution, London.

THE following committee of organization for the United States, for the Eleventh International Congress of Hygiene and Demography, to be held in Brussels, September 2-8, 1903, has been appointed, at the request of the Belgian government, by the State Depart-

ment: Dr. E. A. de Schweinitz, the Columbian University, Washington, D. C.; Dr. A. B. Richardson, the Columbian University, Washington, D. C.; Dr. John Marshall, University of Pennsylvania, Philadelphia, Pa.; Dr. C. Harrington, professor of hygiene, Harvard University, Boston, Mass. The committee desires to secure the cooperation of all those in this country who are engaged in hygienic work, both in attendance at the meeting in Brussels, and in sending papers to the congress. The congress will be divided into two sections, hygiene and demography. The subjects which will be considered are the relation of bacteria and parasites to hygiene, the hygiene of foods, the treatment and prevention of communicable diseases, etc. The important subject in its various phases of the communicability of tuberculosis will be discussed by prominent men. The fee for membership is 25 francs, which may be sent to the Secretary-General, M. le Dr. Felix Pulseys, Rue Forgeur, l. à Liège, Belgium. Those proposing to attend or send papers will please notify E. A. de Schweinitz, Washington, D. C.

A TESTIMONIAL signed by over 500 fellows of the Zoological Society of London has been presented to Mr. W. L. Sclater. It reads as follows:

We, the undersigned, Fellows of the Zoological Society of London, desire to place on record our appreciation of the merits of Mr. William Lutley Sclater and of his conduct in the recent contest for the secretaryship of the society. Mr. Sclater was summoned from Cape Town last January to undertake the duties of secretary, and, although he had some warning that opposition might be expected, he could not have foreseen that, in addition to his arduous duties as secretary, he would have had to face a campaign of an unusual kind or be involved, through no fault of his own, in a position with which we greatly sympathize. Throughout the recent trying circumstances Mr. Sclater has acted with dignity and reserve which may in some measure have sacrificed his own interests, but which place him all the higher in our estimation. We believe that his scientific attainments, high character, and proved ability would have fully satisfied the claims of the position to which he had been provisionally elected, and we can assure him that in returning to Cape

Town he adds to those qualities the respect and esteem of a wide circle of new friends.

THE *Geographical Magazine* learns from the report of the last meeting of the board of directors of the Siberian Railway that the main line is now completed permanently except for the portion circling Lake Baikal, which it is hoped will be finished by the close of 1904. The total cost of the line, including the Baikal section, amounted to nearly 385,000,000 roubles. The number of immigrants who have had grants of land allotted to them is 611,494, and for colonization purposes a sum of 30,000,000 roubles has been assigned. To facilitate the acquisition of agricultural implements and seeds, etc., twenty-nine depots have been established. Arrangements have been made for an efficient prospecting of the country in the neighborhood of the railway, with the view to the development of its mineral resources, and these have already led to the discovery of oil in the vicinity of Sudjenka, in central Siberia, and near Cheremkhovskoje, in the province of Irkutsk. A special grant has also been made for the encouragement of gold prospecting, and an investigation of the Yenesei and Obi has revealed the fact that these rivers are navigable for ocean steamers for a distance of nearly 1,000 miles.

*Nature* notes a great improvement in the appearance and instructiveness of the exhibits in the reptile and fish galleries of the British Museum of Natural History, which were left at the death of Sir W. H. Flower in their original condition. Until the director undertook the rearrangement, the cases were crammed with a number of faded and 'khaki'-colored specimens, unaccompanied by any descriptive labels. The duplicate and superfluous specimens have now, for the most part, been weeded out, and those that are left placed so that they can be well seen by visitors. In many instances old specimens have either been replaced by new ones or have been painted up so as to give them, so far as possible, some sort of resemblance to the living animals; and this process of replacement and renovation is being actively continued. A large

specimen of thunny which has been for many years in the museum affords an excellent example of what can be done by judicious painting. The splendid coloring of the Malay python is displayed in a specimen presented by Mr. Rothschild, as well as by a second example, on which an artist was still engaged at the time when this was written. In the reptile gallery, which is in the more forward condition, descriptive labels have already been placed in several of the cases, in which the specimens have been removed from the old hideous sycamore stands and set on sanded ground-work.

#### UNIVERSITY AND EDUCATIONAL NEWS.

THE Legislature of Michigan has passed a bill appropriating \$171,900 for the Michigan College of Mines at Houghton for the biennium beginning July 1 next. The largest item is one of \$45,000 for the construction of a metallurgical laboratory.

MR. JAMES STILLMAN, of New York, has given \$50,000 to establish a contagious disease ward in Stillman Infirmary, which he founded a year ago at Harvard University.

MR. FREDERICK F. AYER has added \$50,000 to the \$100,000 that he had already given to the Lowell Textile School.

DR. BARTON W. EVERMANN, ichthyologist of the United States Fish Commission, has just returned to Washington from Axton, New York, where he gave a course of twenty-five lectures on 'Fish Culture' and 'Fish and Game Protection' to the juniors and seniors of the New York College of Forestry of Cornell University. The class this year consisted of twenty-two students and is the largest in the history of the college. This course is intended, first, to interest those who are to become foresters in the lakes and streams of the forest, that they may be saved from pollution to the injury of the fishes which inhabit them; and second, to give the students some acquaintance with the mammals, birds, and other animals of the forest, their value, and the necessity for the preservation of those which are not noxious. In addition to the

formal lectures, the students were taken on daily excursions for field observations.

THE Massachusetts Institute of Technology, assisted by several gifts made for the purpose, has established a laboratory of physical chemistry to be opened in September, 1903, which is to be devoted exclusively to research work in that important subject. The laboratory is to be under the directorship of Professor Arthur A. Noyes, with whom will be associated Professors H. M. Goodwin and Willis R. Whitney. The researches will be carried on in large part by a staff of research assistants and associates working under their direction. Every facility will also be offered to advanced students who wish to carry on investigations in this branch of science, either with or without reference to an advanced degree. The research laboratory is to occupy one floor of a new building now being erected for the purpose. It will consist mainly of a series of small laboratories, each of which will afford ample accommodation for two workers, and a well-equipped shop in which a skilled instrument-maker will be regularly employed in making and repairing apparatus for investigation work. Rooms for special purposes—weighing, photographic work, glass-blowing, pure-water distillation, storage of chemical and physical apparatus, and the holding of lectures and seminar meetings—will adjoin the laboratories. The members of the laboratory staff will offer a number of advanced lecture courses and will conduct several seminars on physico-chemical subjects which will be open to all those connected with the laboratory. An announcement of these courses is made in the program of the Research Laboratory issued by the institute.

AT a meeting on May 18 of the Court of Governors of University College, Sheffield, the Duke of Norfolk presiding, resolutions were adopted to the effect that in the interests of higher education in the city and district it was essential that Sheffield College should have the powers and *status* of a university similar to those granted to Birmingham, Liverpool and Manchester, and also that application should be made to the Privy Council for a charter.

THE report of the Mathematical Pass Examinations Syndicate, at Cambridge University, appointed in December, 1902, has been issued, dealing with the mathematical subjects of the previous examination. According to the London *Times* the report makes important recommendations as regards the treatment of geometry. Hitherto Euclid's elements has been the universal text-book, and Euclid's sequences, if not his actual proofs, have been insisted on. Should the senate accept this report, all this will be changed. In the proofs of theorems any proof which forms part of a systematic treatment of the subject will be accepted, so that teachers will be free to use any text-books. As most of the theorems in the schedule to the syndicate's report are to be found in Euclid, many teachers will no doubt adhere to the old method. Another novelty in the schedule is the introduction of questions in practical geometry involving the use of mathematical instruments. For some years changes more or less of this character have been recommended by a committee of the Mathematical Association and a committee of the British Association. With regard to arithmetic, there will not be required a knowledge of recurring decimals and of the process of extracting cube root, but the use of algebraical symbols and processes will be permitted. These changes are unanimously approved of by a very strong syndicate, consisting of the leading resident mathematicians—viz., Mr. Charles Smith, Master of Sidney, Professor Forsyth, Dr. Hobson, Mr. Mollison, Mr. C. A. E. Pollock, Mr. Welsh, Mr. G. B. Mathews, Mr. S. Barnard, Mr. W. M. Coates, Mr. E. T. Whittaker and Mr. A. W. Siddons. It is proposed that the first examination under the new regulations should be held in December, 1904. The proposal as to algebra is not approved by Mr. Coates. At a meeting of the members of the senate, there was almost entire unanimity in favor of the recommendations, the criticism being confined to points of detail. Some of the suggestions will probably be accepted, but the acceptance of the report by the senate is practically assured.

THE question of the expediency of main-

taining the Engineering College at Coopers Hill, as a government institution for the supply of officers to the Public Works Department in India, having again been raised, the Secretary of State for India has appointed a committee to inquire and report to him on this subject. It will be composed as follows: Sir Charles Crosthwaite, late Lieutenant-Governor of the North-Western Provinces and member of the Council of India, chairman; Sir James Mackay, G.C.M.G., Sir William Arrol, M.P., Sir Arthur Rücker, principal of the University of London, and Sir Thomas Higham, K.C.I.E., late of the Indian Public Works Department, with Mr. J. E. Ferard, of the India Office, as secretary.

WASHINGTON UNIVERSITY is extending its teaching force for the coming year by adding an instructor in mathematics, and a professor of psychology and pedagogy.

DR. JOHN GORDON, president of Tabor College, has received an offer of the presidency of Howard University, at Washington, D. C.

DR. L. A. PARSONS, of the Johns Hopkins University, has been appointed assistant in physics at the University of Utah.

DR. S. M. COULTER has been promoted from instructor to assistant professor in the Shaw School of Botany in Washington University, and has been given an additional assistant.

MR. LEWIS A. DARLING, of the University of Nevada, has been appointed instructor in mechanical engineering in Stanford University and will take part of the mechanical engineering work of Professor G. H. Marx, who goes to Europe on a year's leave of absence.

DR. GEORGE WALTER STEWART, instructor in physics at Cornell University, has been appointed assistant professor of physics in charge of the department at the University of North Dakota.

DR. PHILIP HENRY PYE-SMITH, M.D., F.R.S., has been appointed vice-chancellor of the University of London for the remainder of the year for which Dr. Robertson (now Bishop of Exeter) was appointed in June, 1902.